POPULAR SCIENCE

MONTHLY

MECHANICS - AUTOS - HOMEBUILDING

Newest, Largest Proving Ground

Page 125

25¢ September

How to Buy Wood

A 16-Page Special Section

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YOURS! A GIFT OF GOLD-EVERY PURCHASE OF 1 CAR POLISH! $2.25 VALUE

HERE'S THE "BUY" OF THE MONTH!

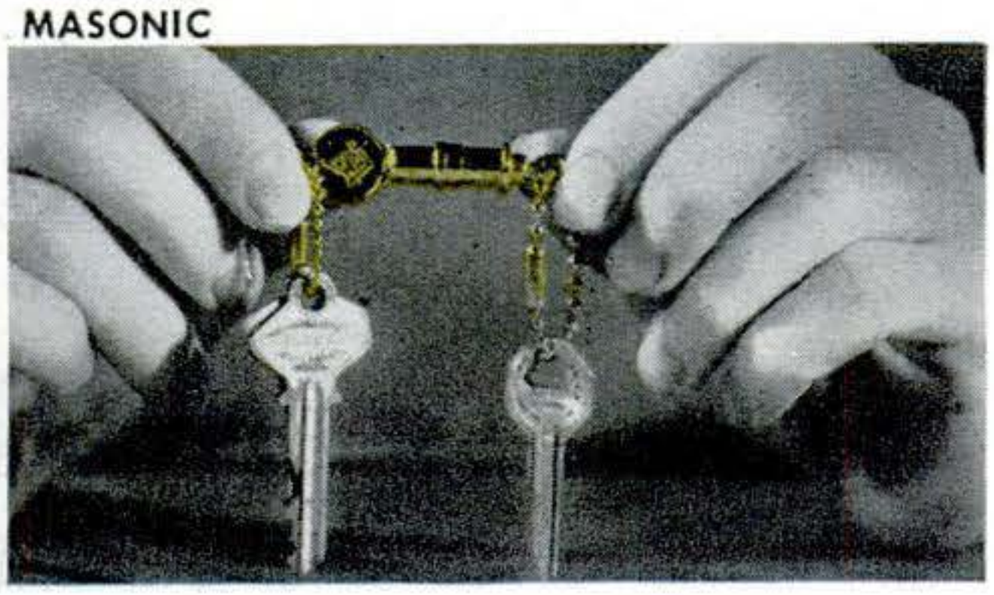
Due to be withdrawn Dec. 31, 1953, so get it now while the gettings good!

REGISTERED TRADE MARK
MODREY CONNECTORS

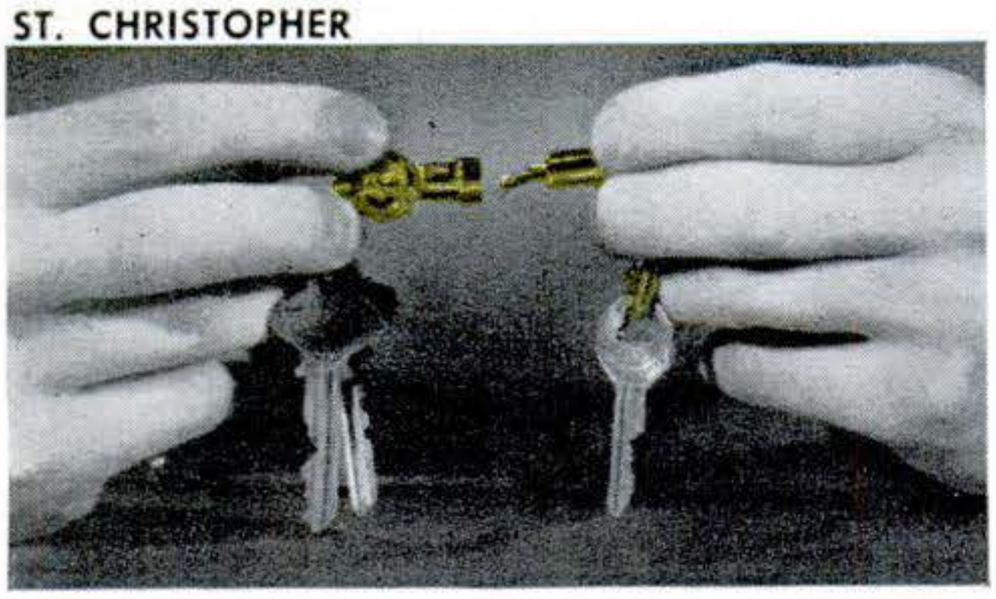
What CAR MAC is!

Car Mac is the smartest, handiest key chain you ever saw! It's beautifully gold-plated with an embossed head on which is either the Masonic emblem or a St. Christopher's medal. Take your choice! The key chain has been called the "Policeman's Friend" because it's such a sound protective device! Nobody knows better than police officers and insurance people the loss hazard of walking away from your car and leaving all your personal keys on the one chain. With Car Mac you avoid this risk! One push on Car Mac's plunger and your car key is on its own chain — you walk away from your car with your trunk, dash compartment, house and other valuable keys on their own chain safely stored on your person.

MASONIC



ST. CHRISTOPHER



Here's how CAR MAC works!

Look at the pictures. On the small chain is your ignition key alone, you can find it quickly in the dark! On the larger chain, all your valuable house, office or other keys. When you wish to leave your car in a parking lot for instance, you merely push the little plunger as illustrated and the two groups of keys are separated. You leave your ignition key and take your "other" keys with you. When you return to your car, simply push the plunger back into its socket and they're both locked together again. Truly a time- and labor-saving, safety device! You never have to struggle to get your car key off the old-fashioned key ring!

Golden St. Christopher and Golden Masonic Car-Macs sell all over the U.S. for $1. An attractive gift as well!

Many styles of Car-Macs sold at stores and service stations. Here are some of the most popular models

Standard Chrome 59c

Gold Crest (with initial bar) $1.00

Golden DeLuxe (Leather Covered) $1.50

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PLATED "CAR MAC" WITH CAN OF I·C·U® Plasticote® FOR $1.50–YOU SAVE 75c

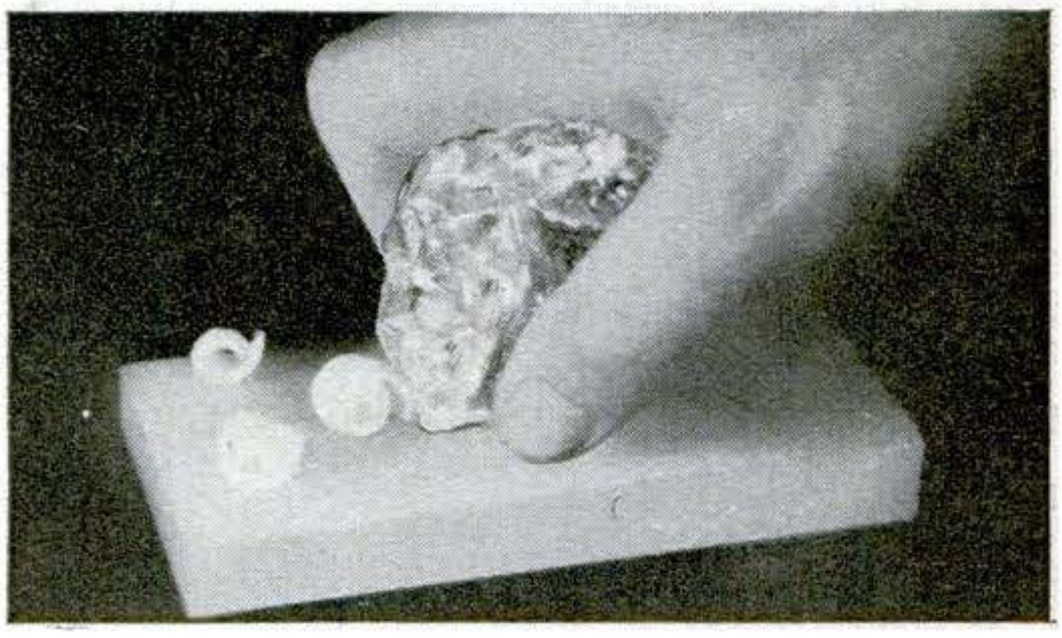
IN SOME WESTERN STATES PLASTICOTE IS SOLD UNDER THE TRADE NAME OF ICU AUTO POLISH

A word about PLASTICOTE!

PLASTICOTE is to automobile polish what jet planes are to airplanes. It's the fastest, hardest, most beautiful finish you can apply. It gives your car that "baked enamel" look that the new sporty foreign cars have! And you can apply it with a simple "smooth-on" application in about 33 minutes — no tough, tiring rubbing! About three applications to a can of PLASTICOTE or three complete polishes to one can for the standard price of $1.25 — and a can is a year's supply. A PLASTICOTE polish is good for up to six months! PLASTICOTE leaves a tough, flexible, transparent protective coat! Once you PLASTICOTE your car you'll never return to old-fashioned elbow-breaking polishes because PLASTICOTE is the newest last word! Put it on tomorrow and you'll say — "it's quick, sure and easy!" Cleans as it polishes, too!

Here's why PLASTICOTE works better!

The "rock" the man holds in his hand looks like a 500 karat topaz. Notice how its gem-like hardness is peeling up the surface of the cake of wax. The "rock" is a piece of the finest plastic made especially for PLASTICOTE. The wax is the sort you find in ordinary automobile polishes. No wonder PLASTICOTE really puts a finish on a car. Waxes at best are soft, melt in hot weather, and may require abrasives to clean the car which really damage paint and *you have to work to make them work!* Not PLASTICOTE—just s-m-o-o-t-h it on, wipe off and you'll say, "it shines!"



GET THIS TOP GIFT-OFFER OF THE MONTH TODAY!

Go to your service station now! Pay your friendly service man $1.25 — the standard price for the large can of PLASTICOTE (I.C.U. Auto Polish in some Western States). Be sure and ask for a sales slip! Send the sales slip to us with twenty-five cents in stamps to pay for handling and shipping charges! That's all you have to pay. Be sure your name and address is clearly written across face of sales slip. Below write clearly "MASONIC" if you want the Masonic emblem or "ST. CHRISTOPHER" if you want that kind of Car Mac. And within 24 hours from the receipt of your order we'll mail you by parcel post (delivery guaranteed) one gold-plated CAR MAC. This offer expires at midnight December 31, 1953.

SEND YOUR SALES-SLIP TO: The Livingston Co., 150 Amity Road, New Haven, Conn. In Canada send to: Ewart-Harris Co., 3835 Allen St., Verdun, P.Q.

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America's Leading New-Idea Magazine for 81 Years

POPULAR SCIENCE REG. U. S. PAT. OFF. *Monthly*

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Mechanics and Handicraft
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Hy Peskin and football *go together. One of the country's top sports photographers, his gridiron shots appear regularly in leading magazines and newspapers. On page 231 he tells you how he brings back those eye-stopping action photos.*

(More features and departments are listed on page 4.)

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EXTRA MILES

of power-packed performance!

...with Perfect Circle 2-in-1 chrome piston rings!

For thousands and thousands of extra miles of top engine performance...in any car, truck or tractor... specify Perfect Circle's 2-in-1 chrome piston ring set!

The 2-in-1 chrome set is as new as power steering... will seal compression and control oil for over twice as long as old style piston rings. 2-in-1 requires no tedious break-in period...you can drive normally immediately after overhaul. And it's the only set that gives you a choice of spring pressures with every oil ring to meet any cylinder wear condition. Don't settle for less! Perfect Circle Corporation, Hagerstown, Ind. The Perfect Circle Co., Ltd., Toronto, Ont.

Cylinders, pistons and rings assured double life because solid chrome resists wear over entire area of ring travel.

Perfect Circle PISTON RINGS

THE STANDARD OF COMPARISON

NEWS from SCIENCE
ABOUT YOUR HAIR

Laboratory discovery outdates messy hair oils!

"V-7," completely new *greaseless* grooming agent, now in Vitalis Hair Tonic. It's *not* an animal, vegetable or mineral oil!

Hair stays neat all day

No gummy film, no oily or matted-down look with new Vitalis!

Kills dandruff germs, too!

New Vitalis kills *on contact* germs many doctors associate with infectious dandruff. Feels *"tingling good"* on scalp!

NEW FINER
VITALIS®
HAIR TONIC
WITH V-7

Product of Bristol-Myers

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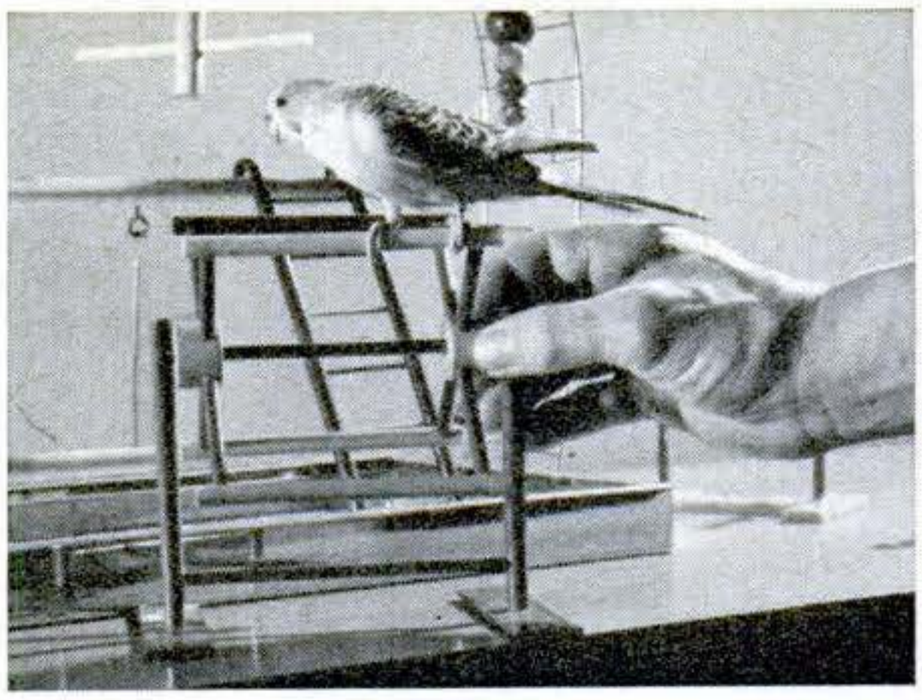
All About the Money Birds



Scads of people all over the country are making money by raising talking birds. We'll give you one guess as to what they are. Yes, that's right—parakeets. These miniature parrots bid fair to become as much a rage as miniature golf was 25 years ago. Want to make money on parakeets? Next month PSM will tell you how.

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Tomorrow's leaders are busy tonight

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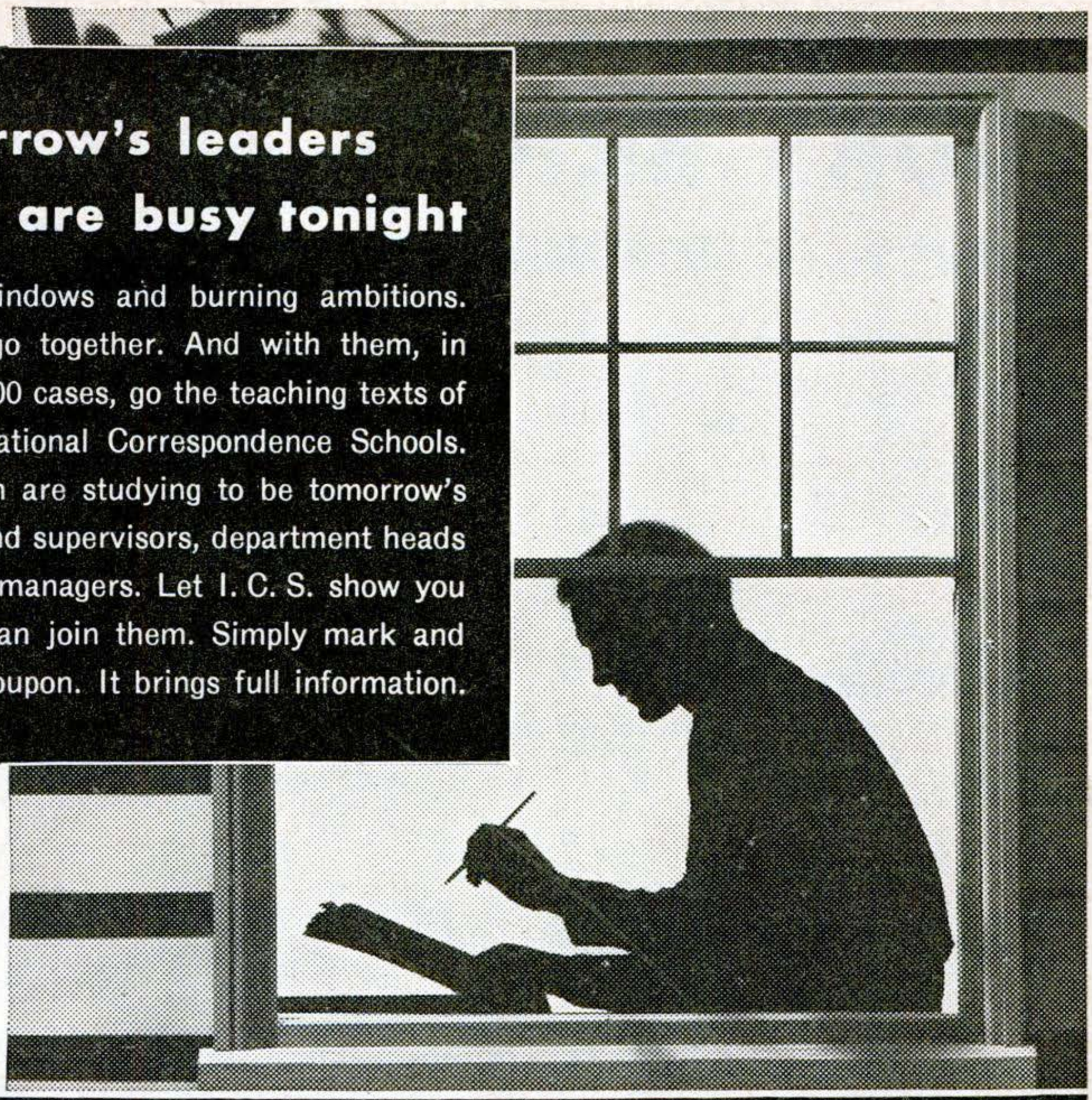

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ICS

BOX 7658-N, SCRANTON 9, PENNA.

Without cost or obligation, send me "HOW to SUCCEED" and the booklet about the course BEFORE which I have marked X:

ART
- ☐ Commercial Art
- ☐ Magazine and Book Illustrating
- ☐ Cartooning
- ☐ Show Card and Sign Lettering
- ☐ Fashion Illustrating

AUTOMOTIVE
- ☐ Automobile, Mechanic
- ☐ Auto-Elec. Technician
- ☐ Auto Body Rebuilding and Refinishing
- ☐ Diesel—Gas Engines

AVIATION
- ☐ Aeronautical Engineering Jr.
- ☐ Aircraft Engine Mechanic
- ☐ Airplane Drafting

BUILDING
- ☐ Architecture
- ☐ Arch. Drafting
- ☐ Building Contractor
- ☐ Estimating
- ☐ Carpenter and Mill Work
- ☐ Carpenter Foreman
- ☐ Reading Blueprints
- ☐ House Planning
- ☐ Plumbing
- ☐ Heating
- ☐ Steam Fitting
- ☐ Air Conditioning
- ☐ Electrician

BUSINESS
- ☐ Business Administration
- ☐ Certified Public Accountant
- ☐ Accounting
- ☐ Bookkeeping
- ☐ Stenography and Typing
- ☐ Secretarial
- ☐ Federal Tax
- ☐ Business Correspondence
- ☐ Personnel and Labor Relations
- ☐ Advertising
- ☐ Retail Business Management
- ☐ Managing Small Business
- ☐ Sales Management
- ☐ Salesmanship
- ☐ Traffic Management

CHEMISTRY
- ☐ Chemical Engineering
- ☐ Chemistry
- ☐ Analytical Chemistry
- ☐ Petroleum—Nat'l Gas
- ☐ Pulp and Paper Making
- ☐ Plastics

CIVIL, STRUCTURAL ENGINEERING
- ☐ Civil Engineering
- ☐ Structural Engineering
- ☐ Surveying and Mapping
- ☐ Structural Drafting
- ☐ Highway Engineering
- ☐ Reading Blueprints
- ☐ Concrete Construction
- ☐ Sanitary Engineering

DRAFTING
- ☐ Aircraft Drafting
- ☐ Architectural Drafting
- ☐ Electrical Drafting
- ☐ Mechanical Drafting
- ☐ Structural Drafting
- ☐ Sheet Metal Drafting
- ☐ Mine Surveying and Drafting

ELECTRICAL
- ☐ Electrical Engineering
- ☐ Electrician
- ☐ Electrical Maintenance
- ☐ Electrical Drafting
- ☐ Electric Power and Light
- ☐ Lineman

HIGH SCHOOL
- ☐ High School Subjects
- ☐ College Preparatory
- ☐ Mathematics
- ☐ Commercial
- ☐ Good English

MECHANICAL AND SHOP
- ☐ Mechanical Engineering
- ☐ Industrial Engineering
- ☐ Industrial Supervision
- ☐ Foremanship
- ☐ Mechanical Drafting
- ☐ Machine Design-Drafting
- ☐ Machine Shop Practice
- ☐ Tool Design
- ☐ Industrial Instrumentation
- ☐ Machine Shop Inspection
- ☐ Reading Blueprints
- ☐ Toolmaking
- ☐ Gas—Electric Welding
- ☐ Heat Treatment—Metallurgy
- ☐ Sheet Metal Work
- ☐ Sheet Metal Pattern Drafting
- ☐ Refrigeration

POWER
- ☐ Combustion Engineering
- ☐ Diesel—Electric
- ☐ Electric Light and Power
- ☐ Stationary Steam Engineering
- ☐ Stationary Fireman

RADIO, TELEVISION, COMMUNICATIONS
- ☐ General Radio
- ☐ Radio Operation
- ☐ Radio Servicing—FM
- ☐ Television
- ☐ Electronics
- ☐ Telephone Work

RAILROAD
- ☐ Locomotive Engineer
- ☐ Diesel Locomotive
- ☐ Air Brakes ☐ Car Inspector
- ☐ Railroad Administration

TEXTILE
- ☐ Textile Engineering
- ☐ Cotton Manufacture
- ☐ Rayon Manufacture
- ☐ Woolen Manufacture
- ☐ Loom Fixing
- ☐ Finishing and Dyeing
- ☐ Textile Designing

YEAR OF THE SIX MILLIONTH STUDENT

Name_____ Age_____ Home Address_____

City_____ Zone_____ State_____ Working Hours_____ A.M. to_____ P.M.

Occupation_____

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NOW OUR HOUSE LOOKS BRIGHT AND NEW

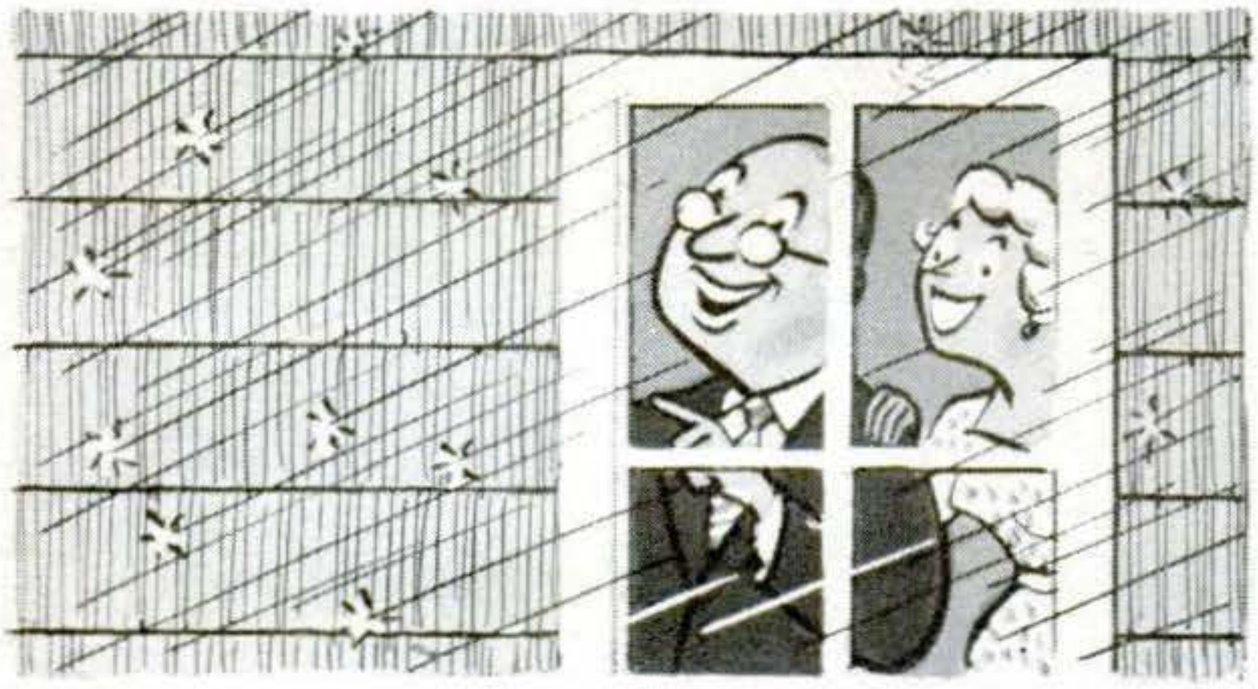
Thanks to GOLD BOND Asbestos Sidewall Shingles

"What do you do when your house needs painting so badly that even the neighbors are talking about it? Dip into your savings account and go ahead with the job anyway? It seemed the only answer for me."

"My friend Joe's house always looked spic and span —like a new coat of paint. 'Paint nothing!' he told me. 'Those are GOLD BOND Chroma-Tex Asbestos Shingles with new color-protecting Surfaseal Finish."

"I went to see my GOLD BOND dealer. He showed me that Chroma-Tex shingles are fireproof...and proof against rot, rodents and termites too. Made of asbestos-cement... they never wear out, never need paint to preserve them!"

"The low cost of having our house sided surprised me. The new shingles went right over our old clapboards. We had a choice of 5 colors and picked one that pleased the whole family!"



"We have the best-looking house in the block now. And, it's a real satisfaction to know that it will *stay* that way... no more repainting worries for us." See the new GOLD BOND Asbestos Siding Shingles at your Gold Bond dealer's today!

You'll build or remodel better with

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Lath, Plaster, Lime, Sheathing, Roofing, Sidings, Gypsum Roof Decks, Wall Paint, Textures, Rock Wool Insulation, Metal Lath, Sound Control Products, Fireproof Wallboards and Decorative Insulation Boards.

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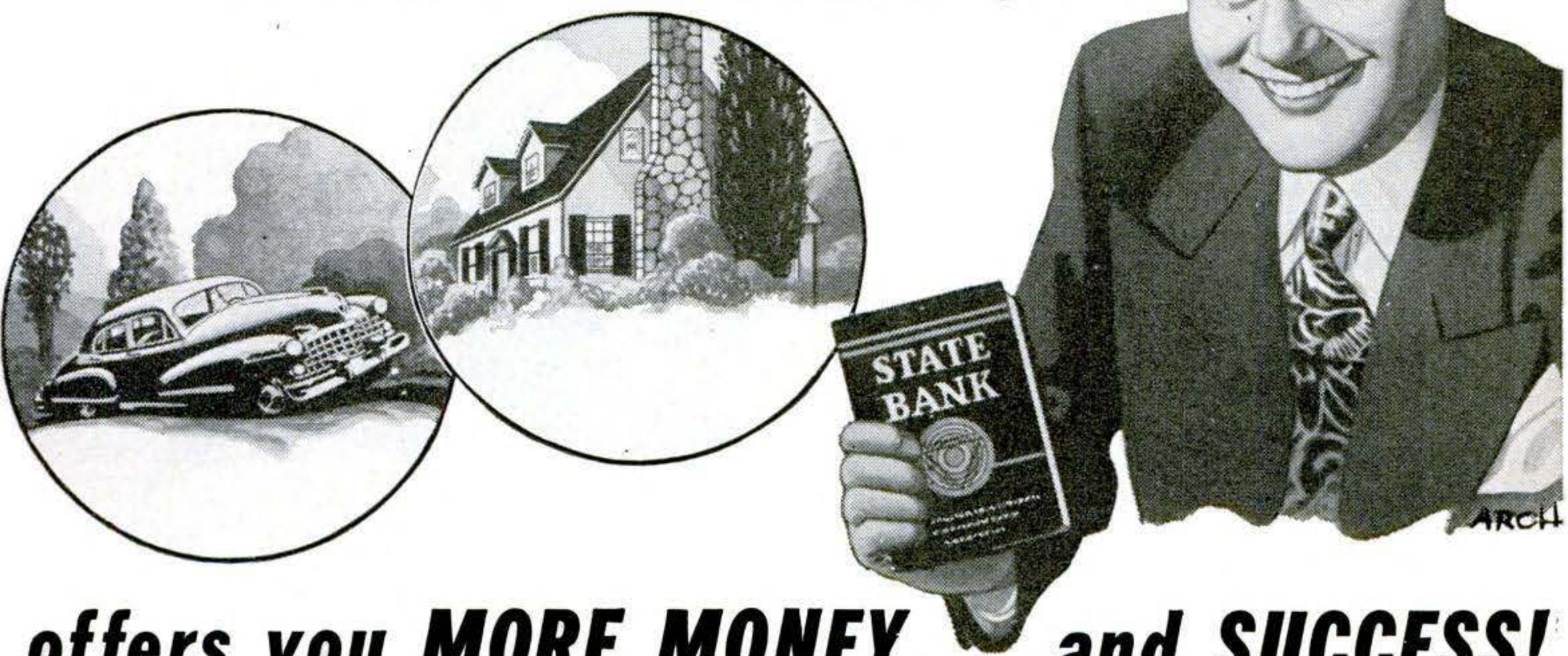
5 *reasons why* ACCOUNTANCY



offers you MORE MONEY . . . and SUCCESS!

REASON #1. If you were an expert accountant right now, chances are you would find yourself among the highest-paid of all professional men and women. Even back in "depression years," surveys showed that accountants earned more on the average than men in other major professions.

REASON #2. The demand for accountants is great—everywhere. All businesses must have trained accountants to cope with ever-growing requirements. It's a profession offering wide opportunity—always—to the man who knows.

REASON #3. You can fit into any business, anywhere in the country—because accounting principles are universal. Think what this means in terms of security and independence!

REASON #4. Accountancy is open to all. Any man or woman of good intelligence, who enjoys figure work and is willing to follow LaSalle's systematic "problem method" plan, can rapidly qualify for a highly profitable, enjoyable lifetime career . . . and he doesn't have to finish his training before beginning to "cash in."

REASON #5. Without losing a day from your present work, you can prepare in spare hours at home, at low cost, under LaSalle's step-by-step "Problem Method" of "learning by doing." This famous plan accounts for LaSalle's remarkable record of having trained nearly 10 per cent of all Certified Public Accountants in the U. S. . . . and of having put many thousands of others into high-paying careers.

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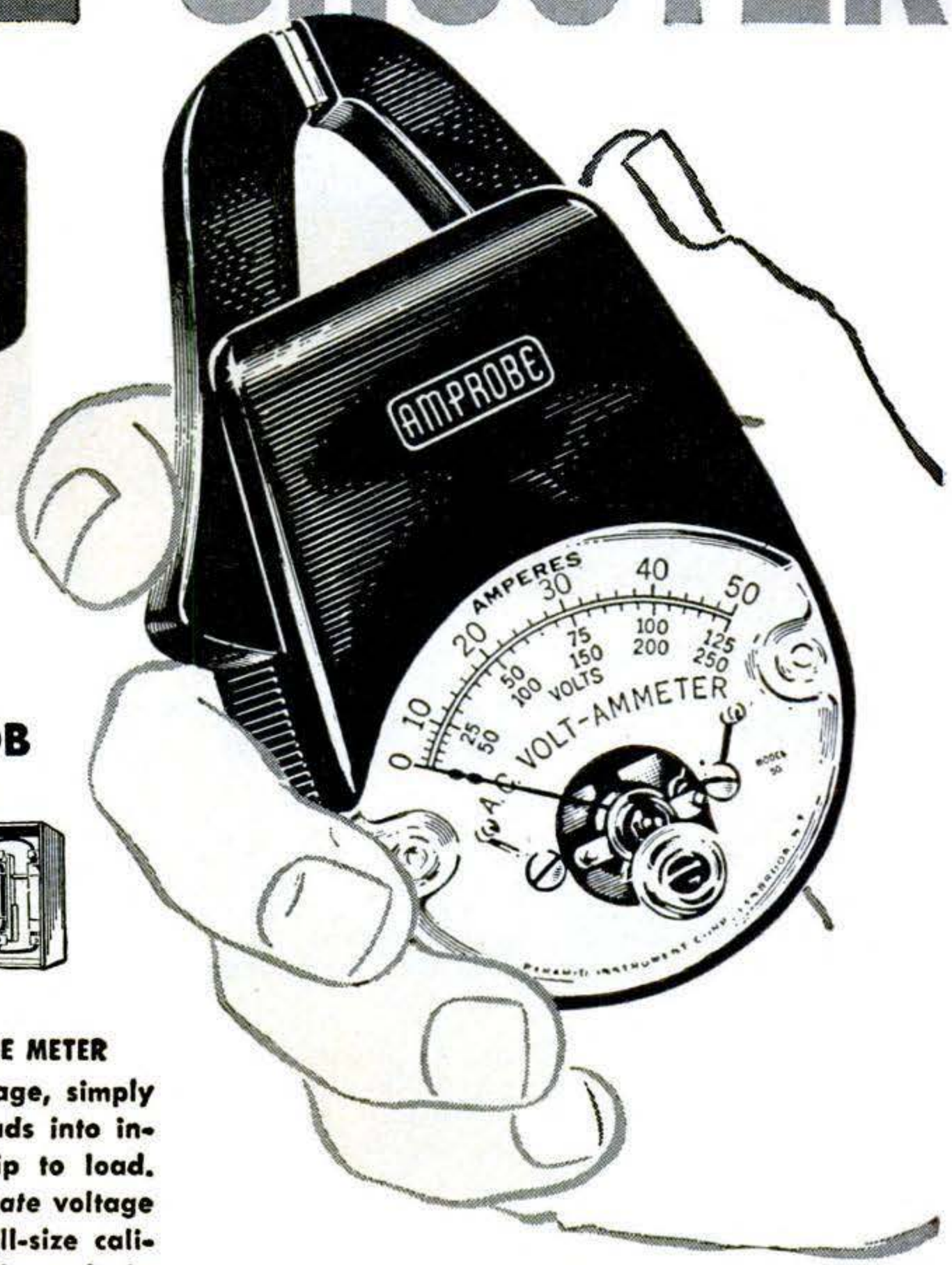
NEW ELECTRICAL TROUBLE SHOOTER

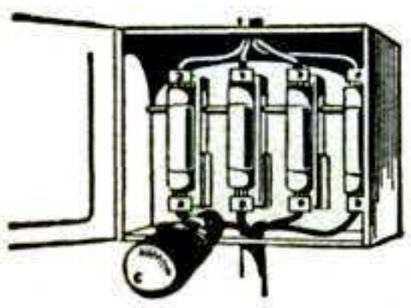
AMPROBE

Junior

VOLT-AMP TESTER

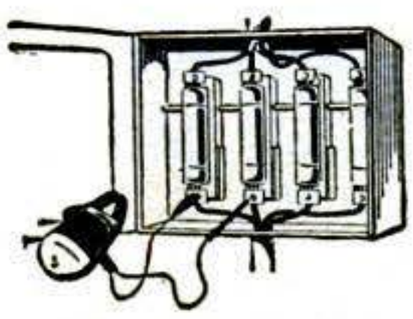


ONE POCKET TESTER DOES THE COMPLETE JOB



IT'S A SNAP-AROUND AMMETER

Measures current instantly without shutdowns or ammeter connections. Just snap the trigger-operated jaws around one conductor (insulated or uninsulated) and you have your reading.



IT'S A VOLTAGE METER

To measure voltage, simply plug the test leads into instrument and clip to load. You get an *accurate* voltage reading on a full-size calibrated scale without doubt or guesswork.

Combines tester ruggedness with instrument accuracy (within ± 3% of full scale)

NOW EVERY ELECTRICAL MAN CAN HAVE A "SNAP-AROUND"

For only a few dollars more than you would pay for just a voltage tester, you can now own a prized snap-around volt-amp tester. With the Amprobe Junior, you can diagnose service calls faster under actual load, check line voltage, determine if wiring is adequate, balance loads, locate grounds, trace shorts, check motor overloads, etc. Ask your wholesaler for a demonstration, or write for descriptive literature and name of nearest Amprobe wholesaler: PYRAMID INSTRUMENT CORP., Dept. PS93, Lynbrook, New York. (Export Div.: 458 Broadway, N. Y. 13. Cable: Morhanex).

Mechanic's net price, at your electrical or refrigeration wholesaler:

$19.85

INCLUDING VOLTAGE TEST LEADS

YOU PICK THE RANGE THAT FITS YOUR JOB:

MODEL "10"	0-10 AMPS AC.	0-125/250 VOLTS AC.
MODEL "25"	0-25 AMPS AC.	0-125/250 VOLTS AC.
MODEL "50"	0-50 AMPS AC.	0-125/250 VOLTS AC.
MODEL "100"	0-100 AMPS AC.	0-125/250 VOLTS AC.

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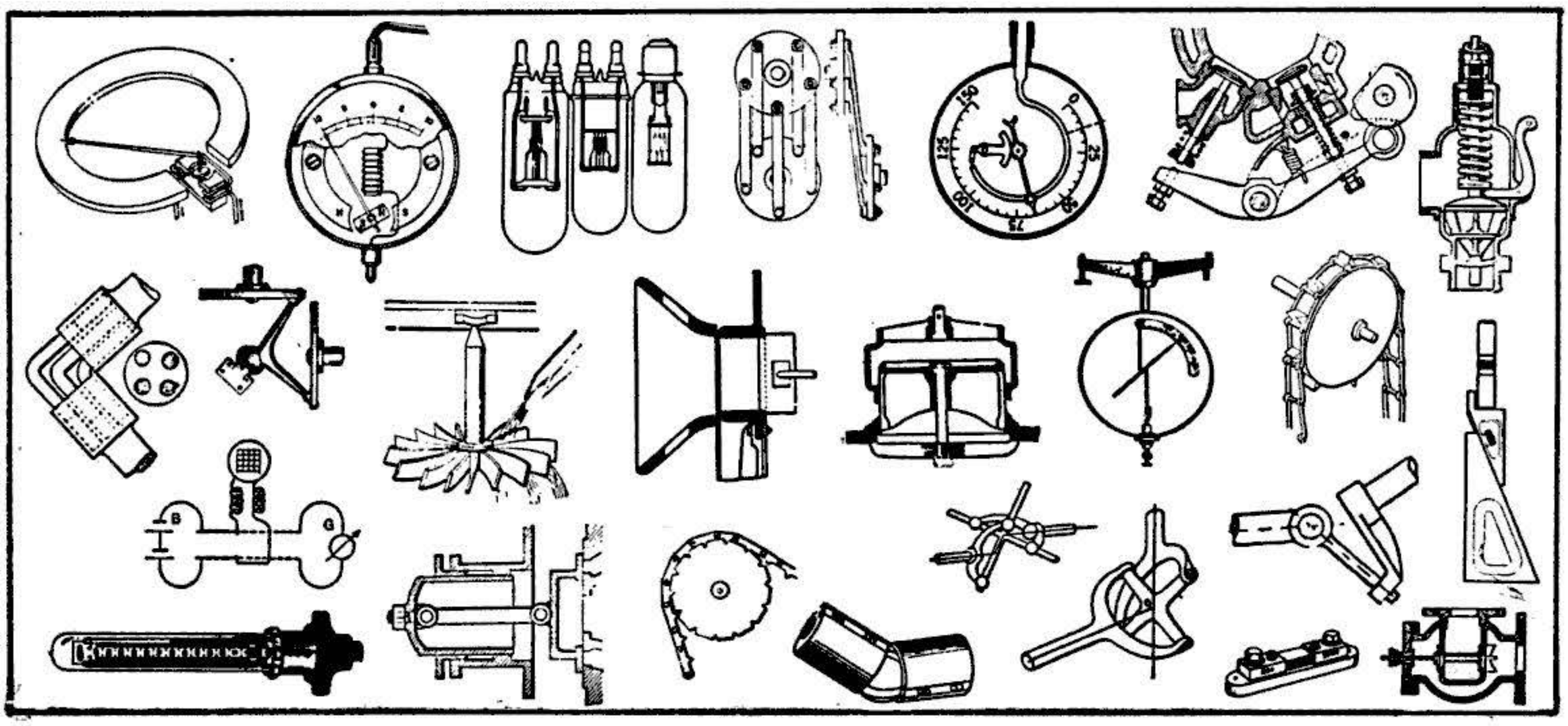

of Every Conceivable Kind of

Mechanical Device, Contrivance, Movement and Detail!

PARTIAL CONTENTS

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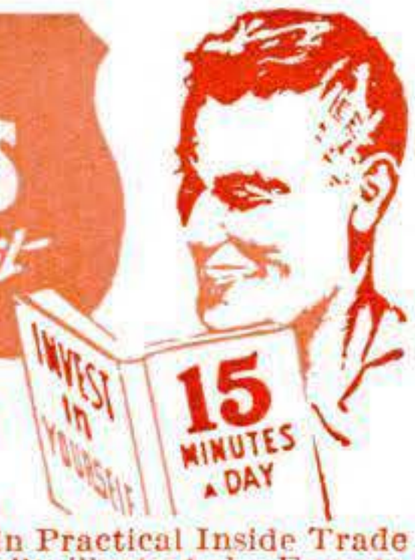

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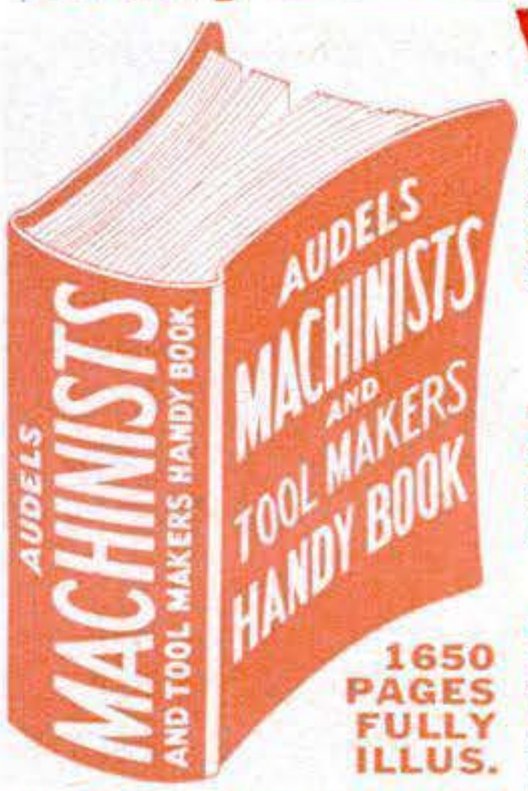

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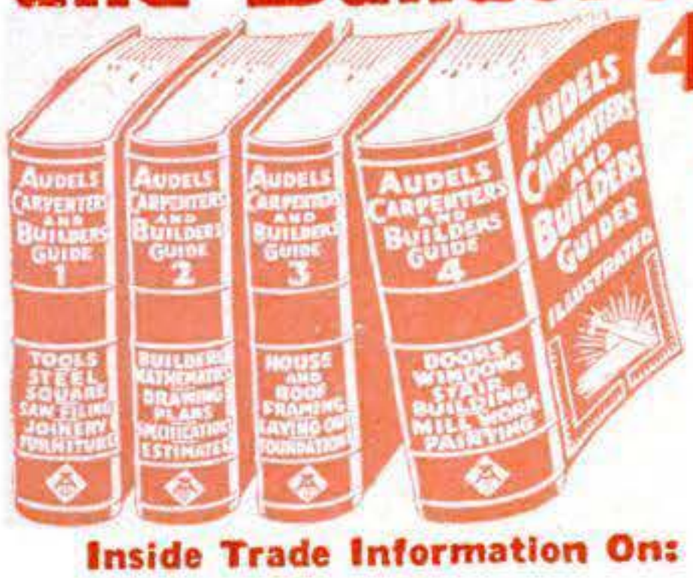

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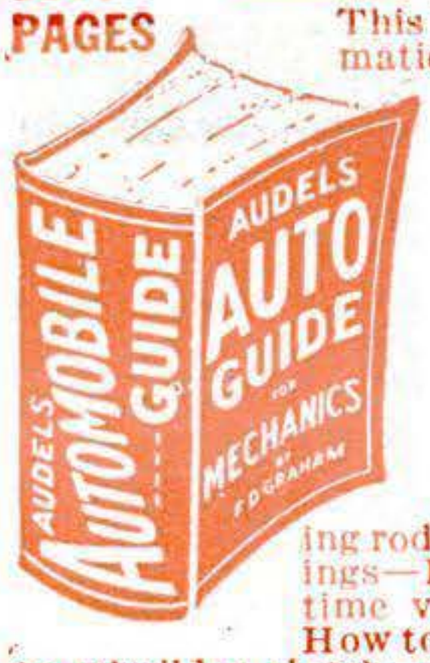

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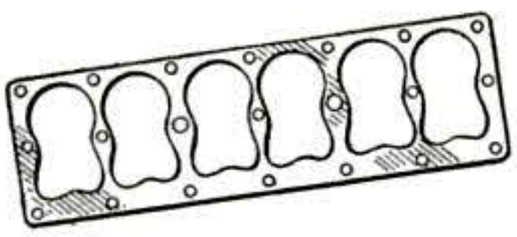


REPAIR HEAD GASKETS

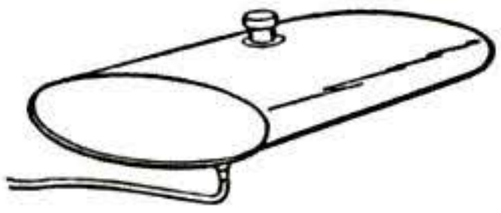
Coat new head gaskets on both sides with Form-A-Gasket No. 3. If no replacement is available, repair old gasket with Form-A-Gasket No. 1.

STOP RADIO RATTLES

Vibration works speaker screws loose and causes noise. Cement cone with Form-A-Gasket No. 1.

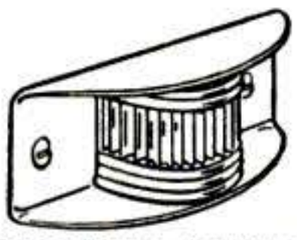
SEAL PAINT CANS

Save your half-filled cans of paint by brushing Aviation Form-A-Gasket No. 3 on sealing ring of can.



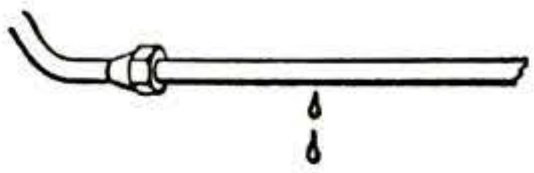
PLUG GAS TANKS

Use a sheet metal screw larger than the hole. Push screw through a piece of gasket material. Apply Form-A-Gasket No. 1 and insert screw in hole



MOUNT LAMPS

Coat the back of truck clearance lamps with Form-A-Gasket No. 2 to prevent water seepage. Lamps can easily be removed for replacement.



REPAIR GAS LINES

Disconnect leaking gas lines and cover with a light coat of Form-A-Gasket No. 1. Allow to dry, tape, then apply another light coating of No. 1.

3 TYPES

No. 1 Sets quickly, dries hard

No. 2 Sets slowly, remains pliable

No. 3 (Aviation) Brushable liquid, sets to a paste; remains tacky.

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Letters—

Silver Six Feet Down

Your article "What You Can Do with a Snorkel" [July, p. 168] inspired me to buy a piece of tubing and go snorkeling. I found out the hard way at which depths you can breathe. Snorkeling along in Lake Norfolk, I saw a glitter in among the rocks about six feet down. The result was 80 cents in small change (five dimes, a quarter and a nickel). This beats Mr. Sneigr's discovery.

I also found another comforting fact for fresh-water snorkelers. The small pan fish in most little lakes are extremely curious, and more adventurous than that fish mentioned in your article. Two five-inch perch followed me around for about half an hour,

every so often peering in through my mask and occasionally striking it. They then darted off and would loiter about two or three inches from the face plate. A most interesting show, to say the least.

STEVEN SANDERS, Flippin, Ark.

All Set to Go Below

Last winter I tried to make an underwater breathing unit. Though I obtained a great deal of information from the Government, I felt I did not have enough know-how to build a lung. I think that after reading your July issue I am fully prepared to make a suitable device of the sort I want.

I hope to be an engineer after my studies at Rensselaer, and I find that your publication not only keeps me aware of new scien-

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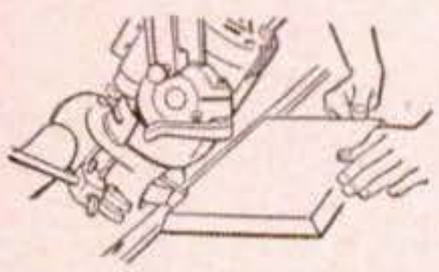

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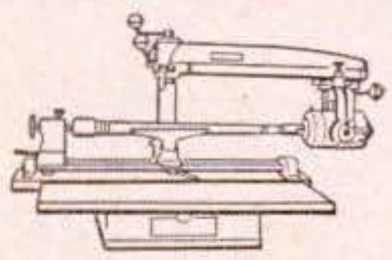

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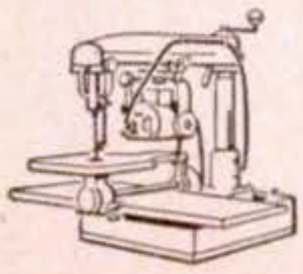

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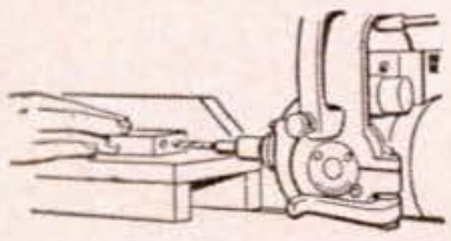

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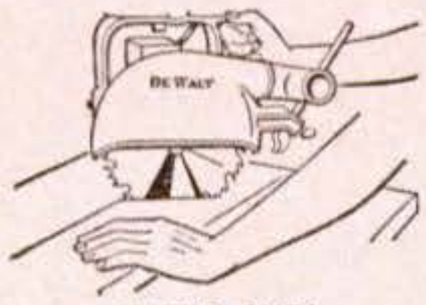
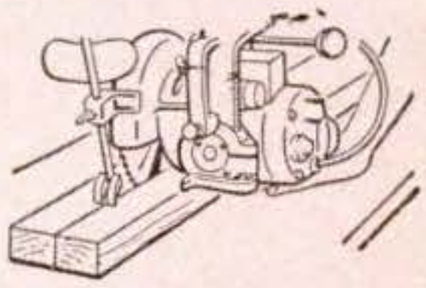
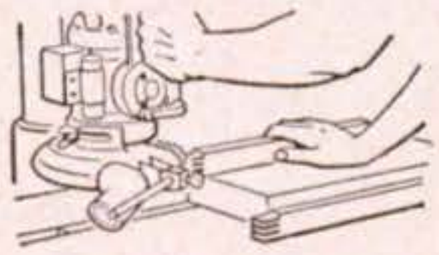


MITER CUT!



RIP CUT!



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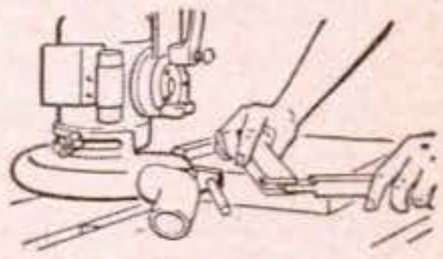

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tific developments and important discoveries but also indicates the many advances yet to come.

WILLIAM G. HEATZIG, Newtonville, Mass.

Wrong-way Pump

I hope your article on protecting water pumps with a reset switch [July, p. 159] has not caused very many readers to go wrong. As you show it, the pressure will vary from absolute zero, with the pump running, to the pump cutoff pressure.

RICHARD J. WERNER, Evansville, Ind.

Correct, you are. Contributor Andrew Pfeiffer writes: "The drawing I mailed was in error. The reset switch should go between the pump and motor, not between the motor and well."

Science and Fiction

Let's lay off the pulp stuff ["Islands in the Sky," June, p. 140]. That's for the small boys and the birds.

H. Y. BALLOU, Manhattan Beach, Calif.

Let's stick to the 81-year-old policy of featuring actual accomplishments of science. I read POPULAR SCIENCE for facts, not fiction.

GEORGE M. EISENBERGER, Washington, D.C.

I enjoyed the June issue very much and thought that the science-fiction story was tops. Keep it up.

RICHARD GERSTEIN, Rego Park, N.Y.

Would you boys like to put on the gloves and settle this issue?

Feel Like Economizing?

Yours has been a most novel approach to advise the motorist how he can conduct his own personal economy run [June, p. 170]. I have an idea that a good many of your readers are going to do exactly that.

ROGER MAHEY, Los Angeles.

Now We're in a Museum

Your article on fluorescent ink in the May issue is a MUST for our collection. How

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LOUIS WALTON SIPLEY, Director
American Museum of Photography
Philadelphia, Pa.

Original copy and proofs of "His Magic Makes the World Glow" [May, p. 154] now repose in the American Museum of Photography.

Craves a Rear Burner

Rear engines? I don't think they would handle right in an American car equipped with the usual *super-blob* tires. But in a wreck give me lots of nice, soft sheet metal

in front of me to soak up the impact, and put the engine in the rear, so it can't come crashing through the fire wall.

DON PROWS, Menlo Park, Calif.

No Sooner Said Than Done

I'd like to know why you don't publish more stories about motorcycles. There must be thousands of your readers who, like me, are fans of this great sport.

WALTER L. AREND, Alajuela, Costa Rica.

Unless the mails to Costa Rica are unusually slow, Reader Arend must by now have read "He's the 'Golden Boy' of Motorcycle Racing" in the August issue, and presumably views us with more favor.

For Drowsy Drivers

I was quite pleased to read the very excellent story on the New Jersey Turnpike in your July issue, but there is one reference in your story which I would like to correct. For some time we have endeavored to keep motorists from pulling off on the shoulder of the road for any purposes other than emergency repairs. If they are drowsy, we urge and require that they use our service areas, which are for that purpose.

You have done a real service to the New Jersey Turnpike and to the welfare of drivers who use our facility and, for that matter, any highway. As Vice-Chairman of the Au-

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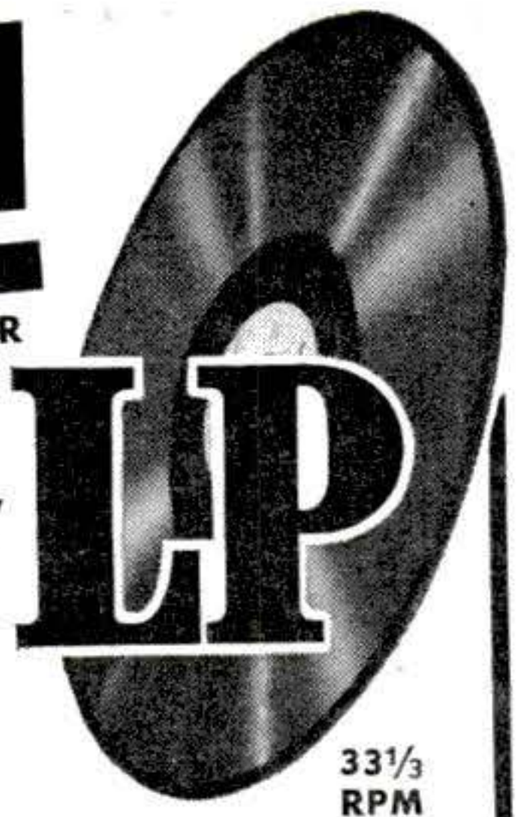

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The boys stationed up here got to gassing about 1953 American stock cars. Will they actually clock 100 miles per hour and over?

Pfc. TIM TOMBERLIN, APO 81, New York.

Wilbur Shaw has clocked over 100 m.p.h. in a new Chrysler, Buick, Olds, Cadillac, Lincoln and Packard. But bear this in mind: all car manufacturers these days are deliberately building errors on the high side into their speedometers in an effort to help trim accidents.

We *Meant* 1,000,000 Watts

In "I Flew with Our Radar Scouts" [June, p. 127], the author refers to a "million-watt, but small and lightweight radar unit." Wouldn't that require a big engine and a big generator?

CHARLES C. FINN, Seattle, Wash.

A radar transmitter loafs most of the time. It may produce 1,000,000 watts of power for one microsecond, then rest 200 microseconds before producing another such burst of power. In this case, the average continuous *power produced is only 500 watts, and comes from generators driven by the plane's engines.*

How to Handle a Handle

You recently told how to take a broken handle out of a tool [June, p. 217]. Instead of putting that screw in the vise, what's the matter with just putting the handle in?

BERNARD BYRNE, Ruby, N.Y.

Nothing, if the handle were long enough, but the one we showed wasn't. It would have been crushed in the vise jaws, if, indeed, there had been enough for the vise to get a grip on. The heavy screw, on the other hand, bites deep into the wood to hold it securely while the tool is driven off.

Universe in a Drop of Water

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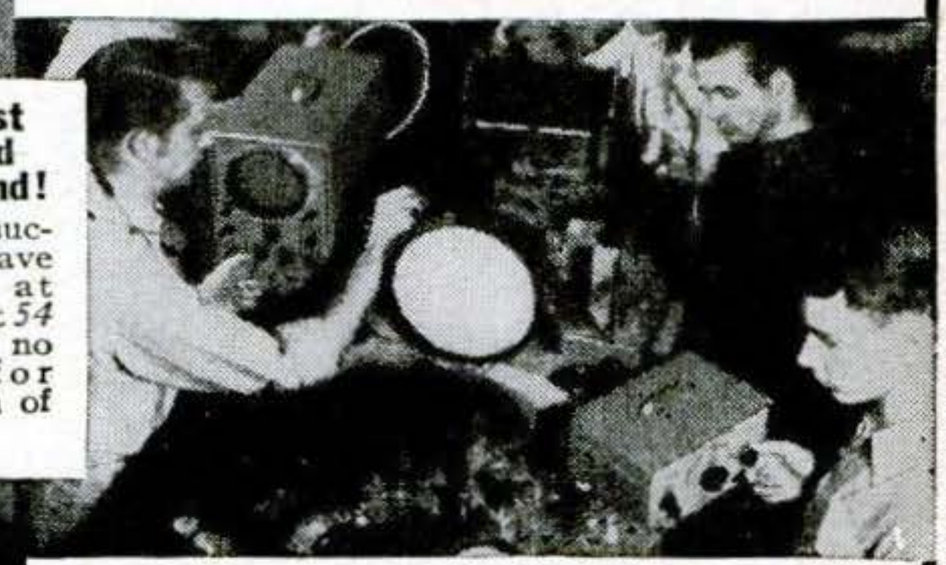

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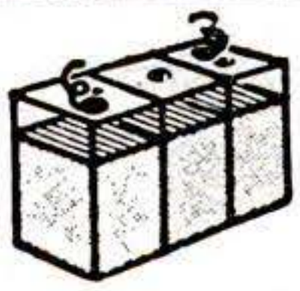

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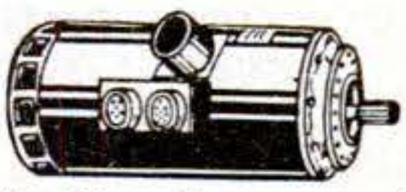

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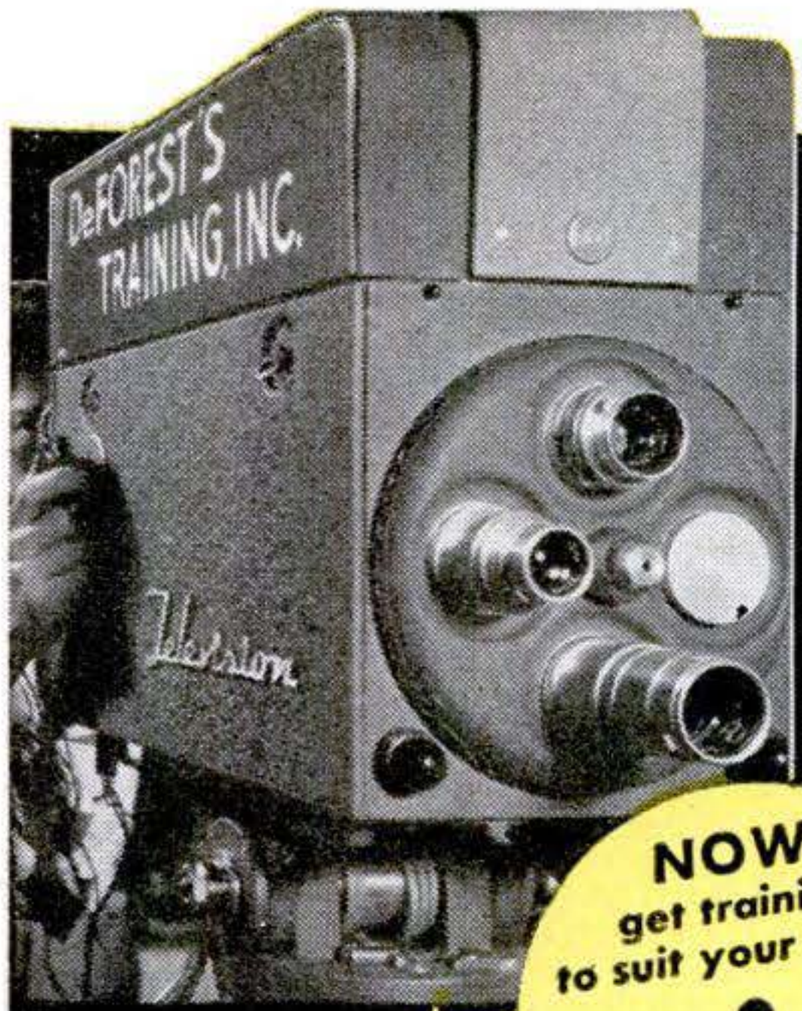

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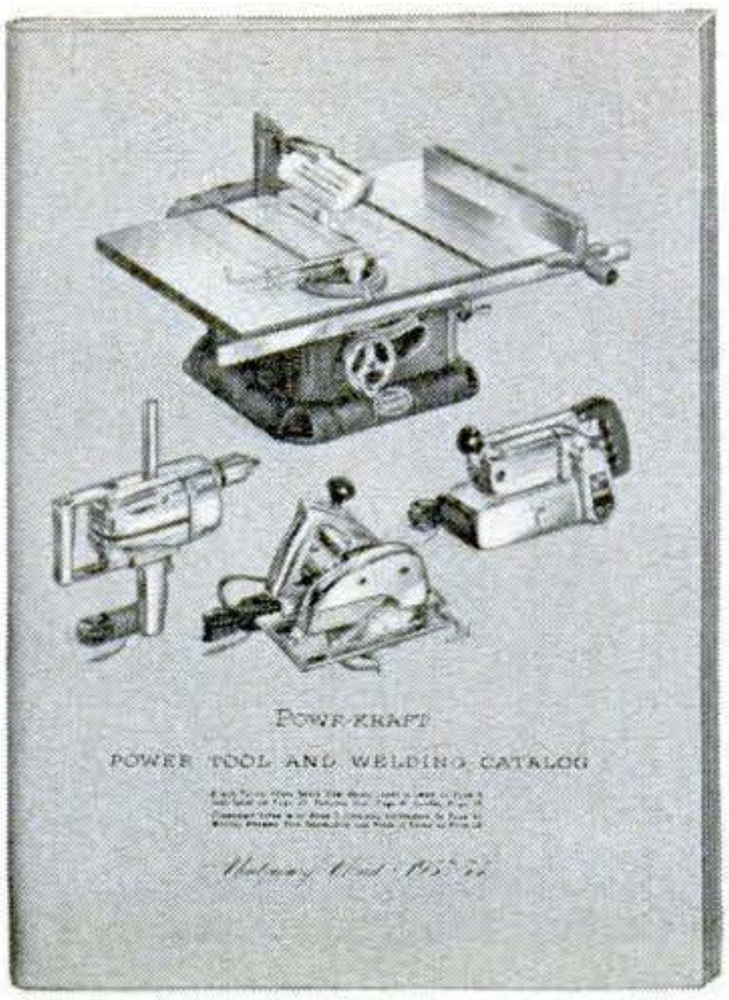

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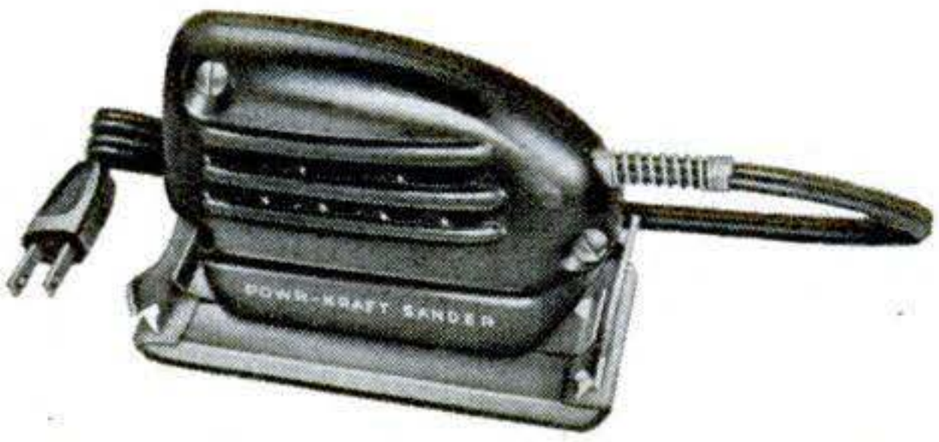

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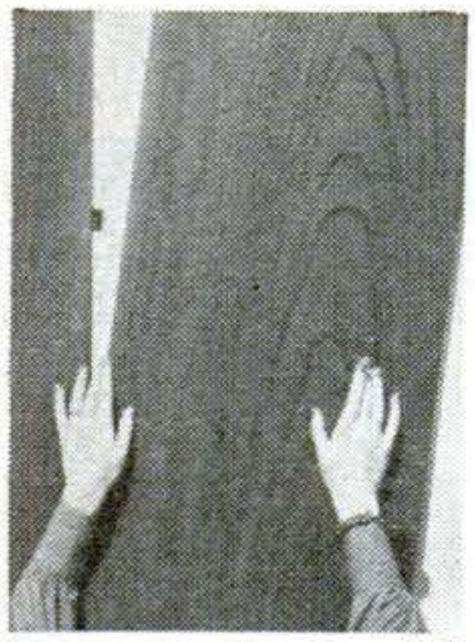

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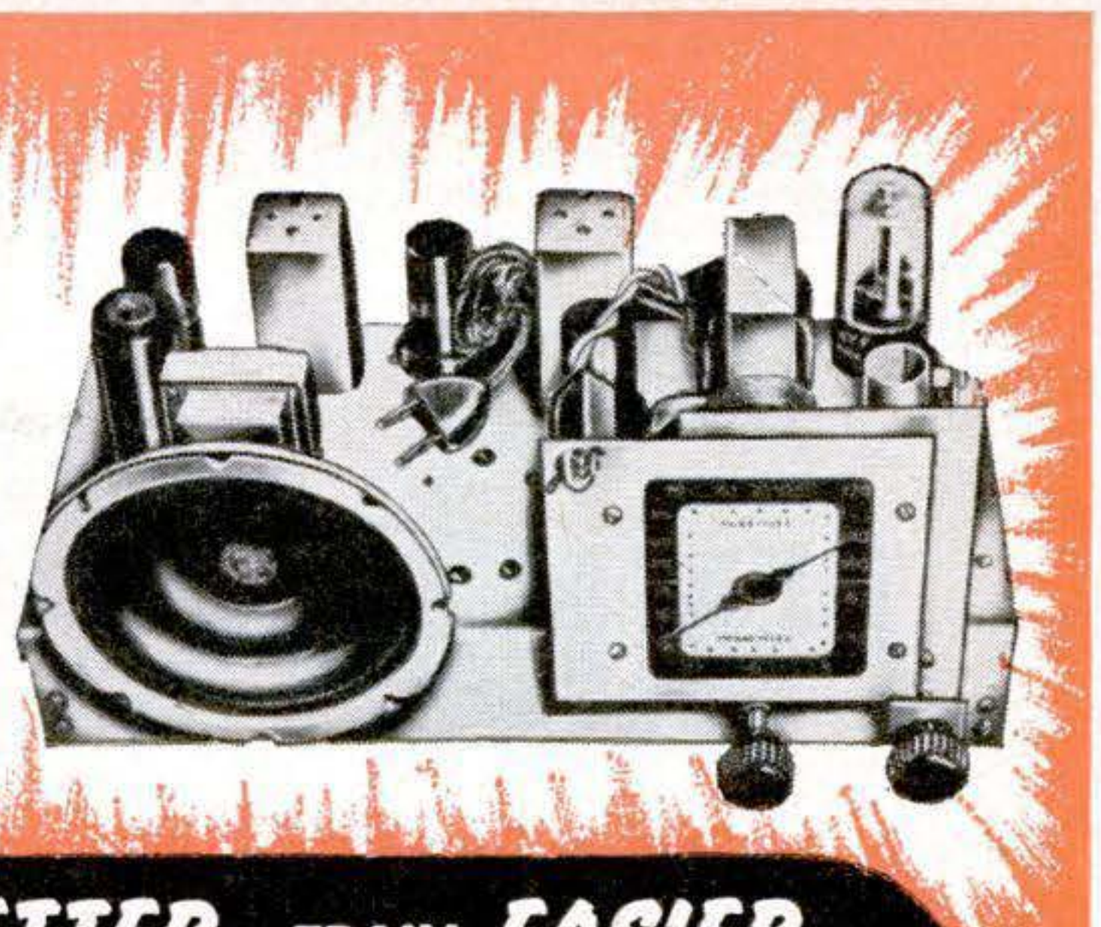

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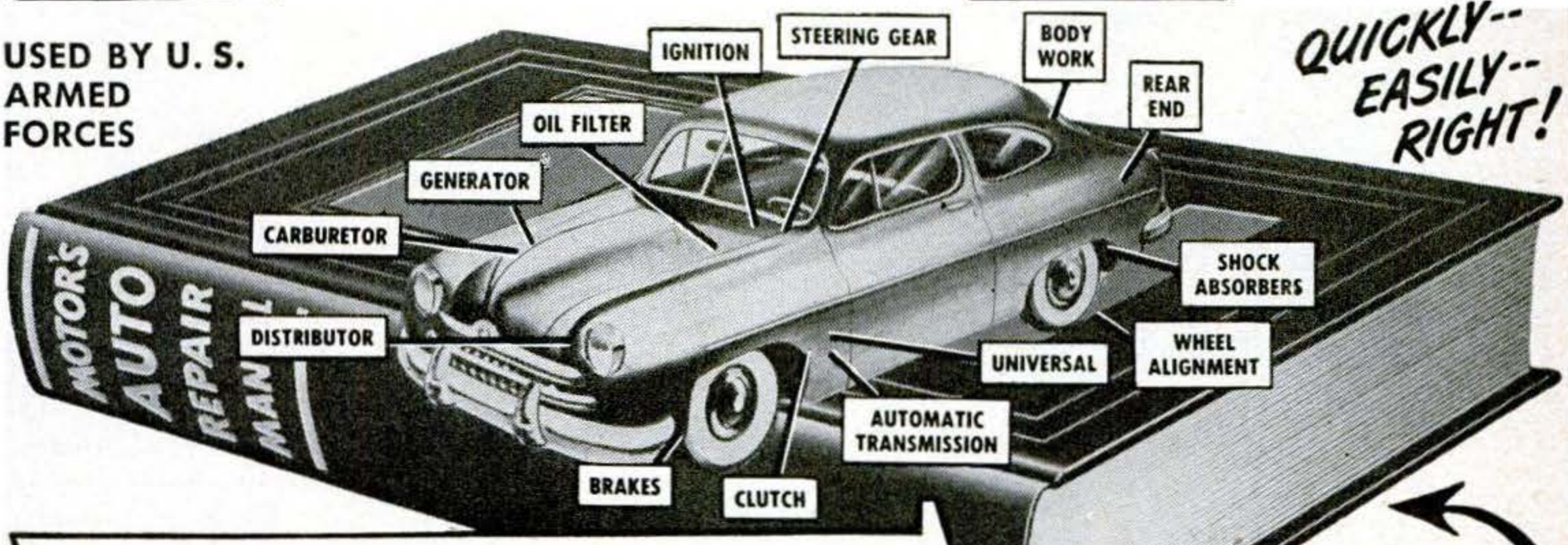

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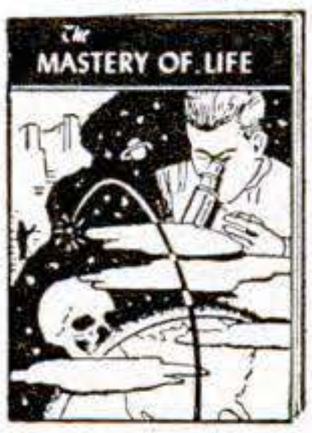

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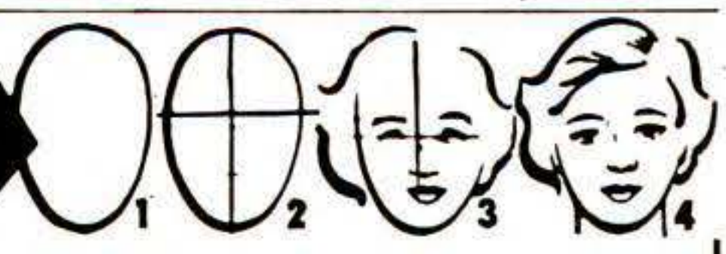

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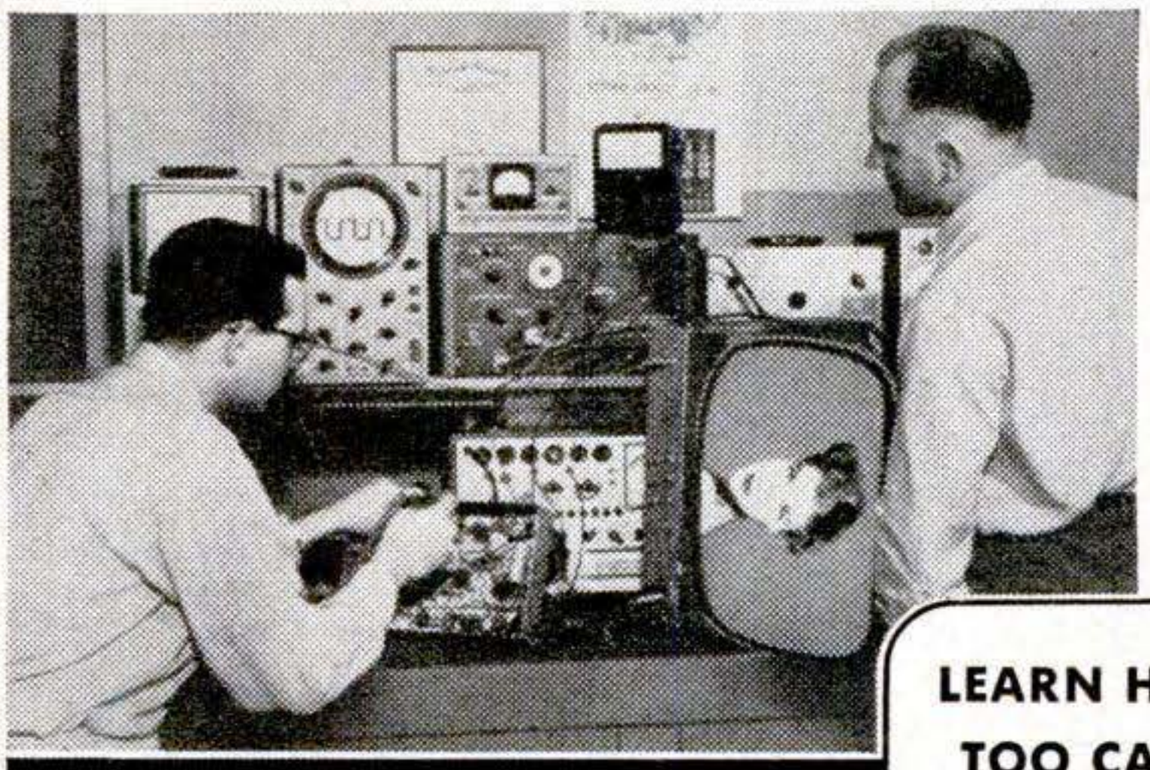

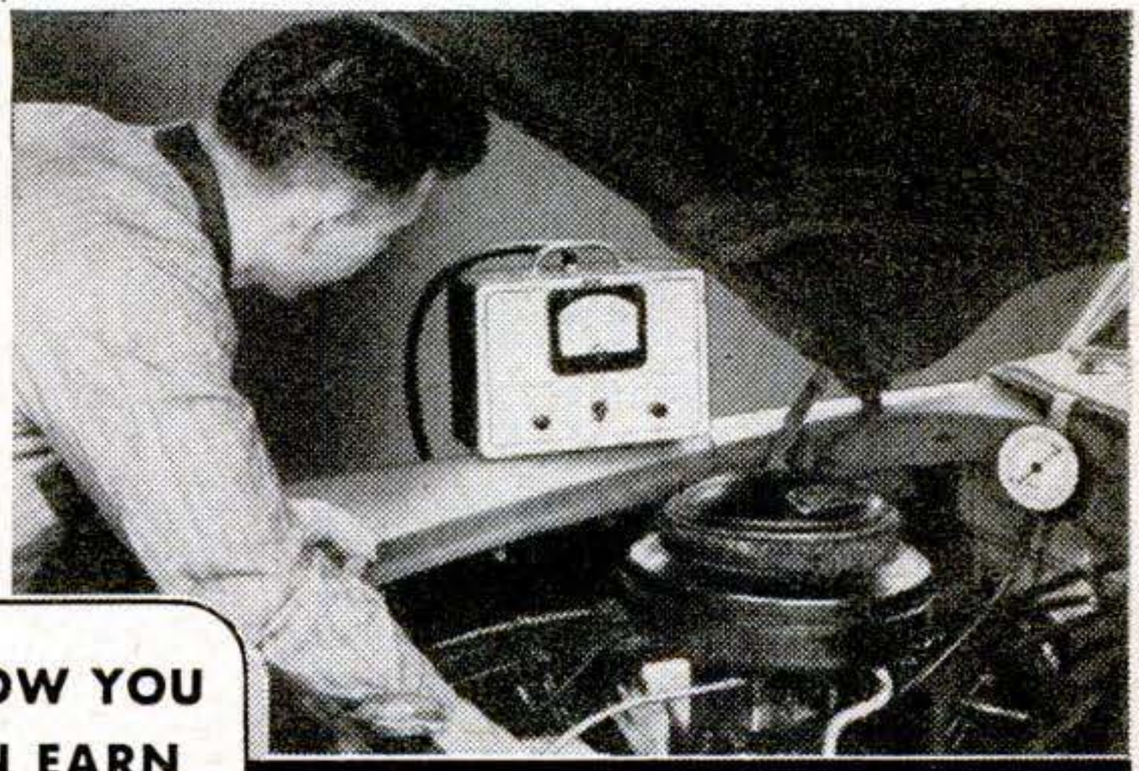

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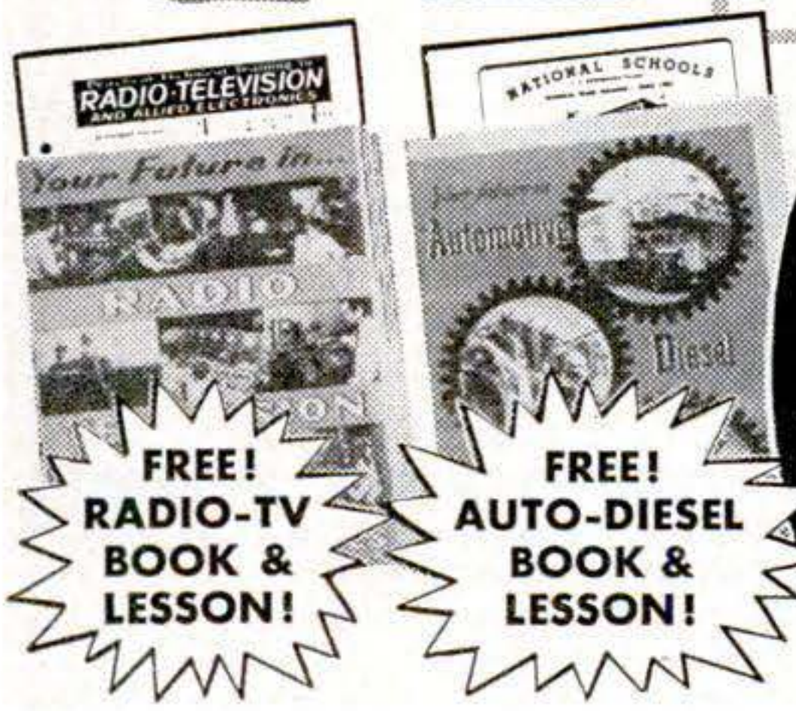

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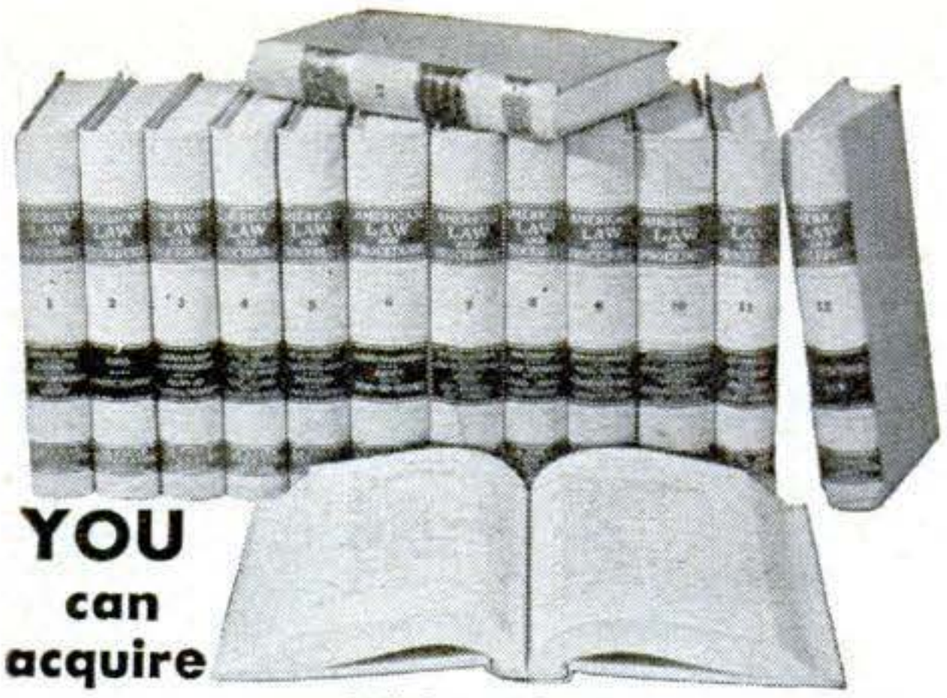

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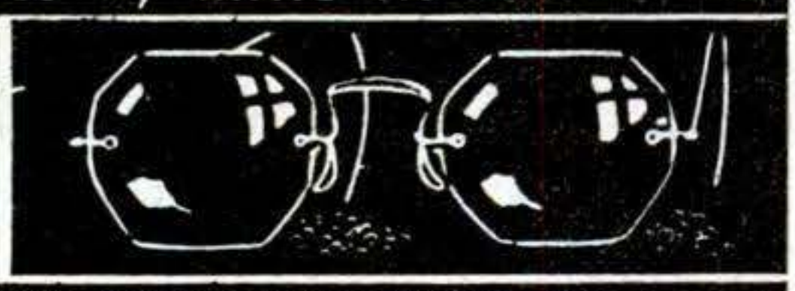

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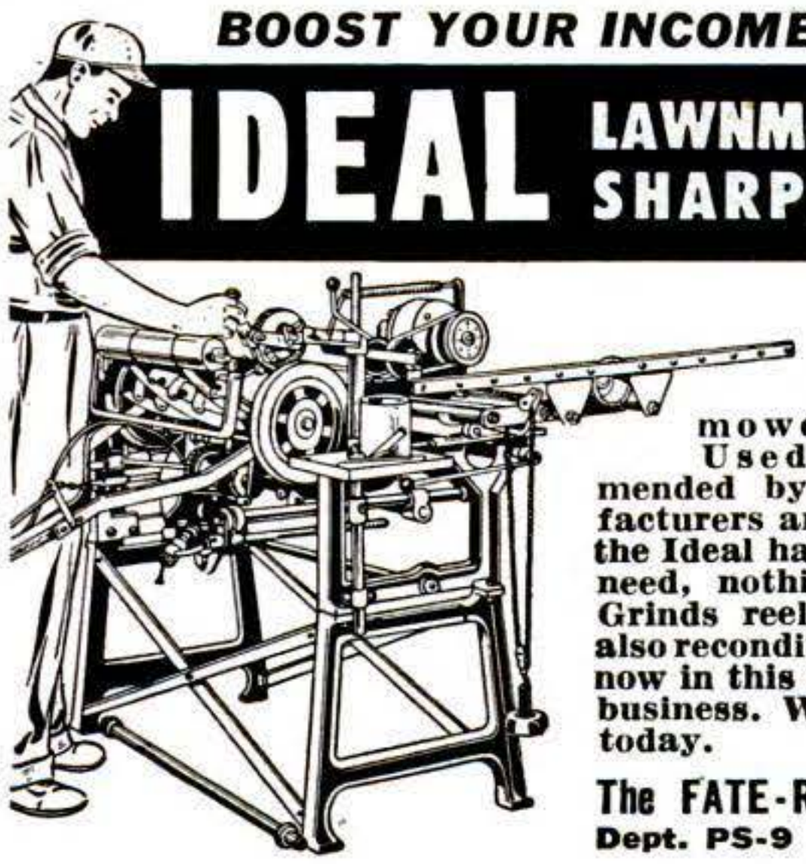

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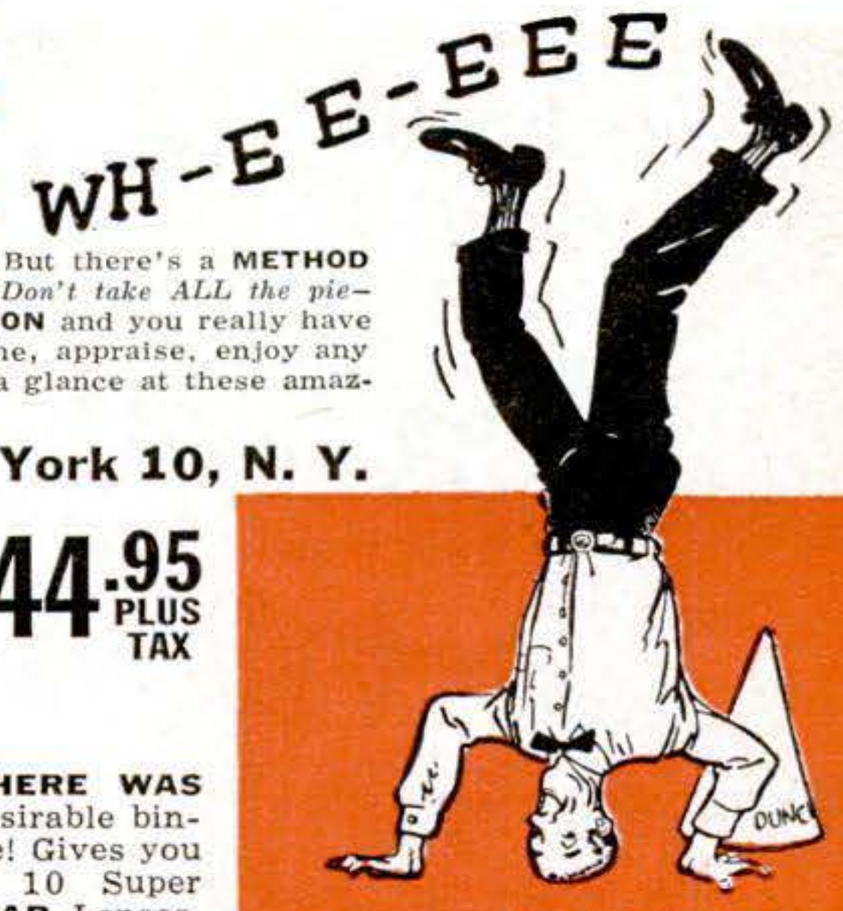

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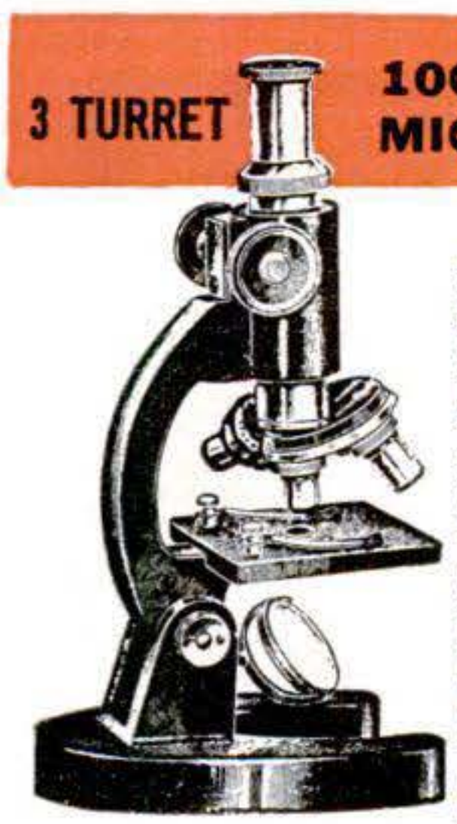

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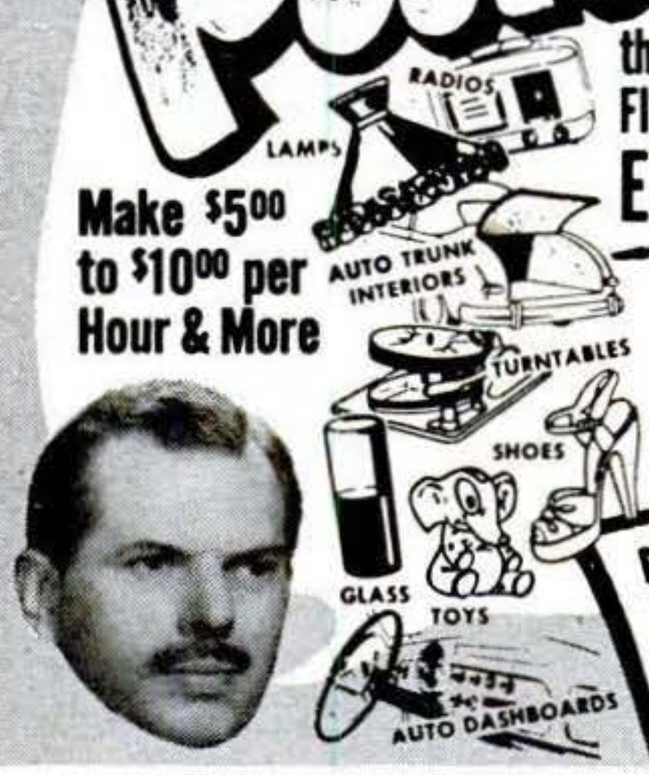

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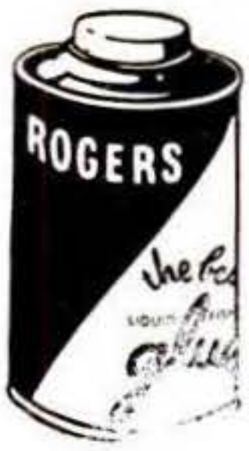

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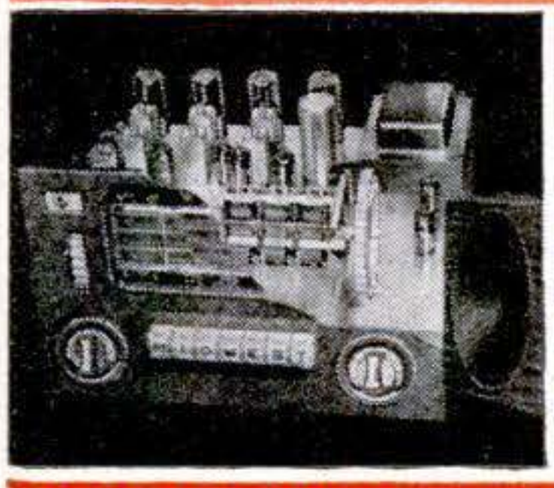

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Use your FULL voice to get things done fast. People listen to and respect a hearty voice.

Success-Winning Voice

Dramatize your voice and you'll be more convincing. A strong voice aglow with enthusiasm is almost irresistible.

YOUR VOICE—AND YOUR PERSONALITY

A *virile* voice is a friend-winner and a success-magnet. People admire the man whose voice possesses calm, controlled *power*.

TIME-TESTED METHOD
More than 125,000 students trained since 1916

The Feuchtinger Voice-Method has helped many famous actors and singers but I am more interested in the good we have done for businessmen, clergymen, teachers, lawyers, salesmen, executives, union officials, etc., etc.

The results my students achieve are very often AMAZING! These sensational benefits are reported by many men who, before they enrolled, didn't even realize they needed voice training!

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See for yourself why my method is so effective. Let me send you, in plain envelope, interesting information about how my home-study course can help you—in the privacy of your own room. Mail coupon below. No salesman will call. Prefect Voice Institute, 210 S. Clinton Street, Studio JX-1, Chicago 6, Ill.

Eugene Feuchtinger, PREFECT VOICE INSTITUTE
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Please send me—free and without obligation—your helpful book "How to Strengthen Your Voice for Greater Success." Mail in plain wrapper. No salesman will call. I am mostly interested in the following: (Please check one or more)
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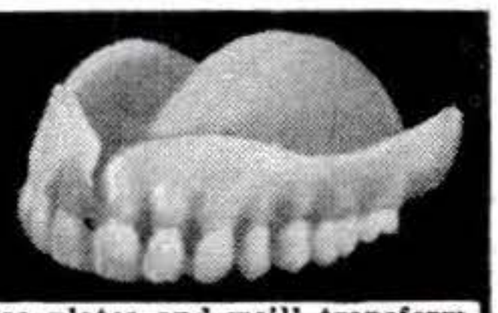

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I have a good proposition for men or women who would like to make an extra $125.00 a month for spare time

These 15 Utensils and covers are all interchangeable. They fit into each other so as to make up 23 different cooking combinations for "Waterless Cooking." The four egg cups make a 19-piece set that covers 99% of all cooking needs.

By F. T. Strong

I won't make any fancy promises of $50.00 a day. And I'm not after any of your money. What I can do is show you a simple plan by which you can pick up enough extra money every week to help make up for the money you're losing in higher taxes and higher costs of living. And I supply your working outfit free—no charge and no deposit. Just your name is all I need. Read my proposition. It is honest and down to earth. And it won't cost you anything to try it.

TODAY almost everyone needs extra money. Increased taxes and increased living costs are making your dollar worth less and less, so you have to have more and more dollars just to keep even. There are lots of good ways to make extra money. I don't say my way is the best. I do say it's one of the easiest and most pleasant. It even leads to making new friends. It doesn't call for house-to-house canvassing, either. Let me explain:

I am Sales Manager for a very big manufacturing company. We make Stainless Steel Cooking Utensils. We do an enormous business with hotels, restaurants, hospitals, and institutions. We also make utensils for the Army, Navy and Air Force.

As a result, we have very low manufacturing costs. We can **sell** a set of Stainless Steel Cookware for home use for about what it costs some companies **to make it!** In fact, for years we did sell to one Sales Organization who resold our cookware house to house under their own name. They got $120.00 for the same set that our people sell for approximately half of that.

You've probably heard of salesmen who give dinner parties in homes and then take orders from the ladies who attend. These salesmen have to get a high price because it costs money to give parties—he has to make his share—and his supervisor has to make his. The sales organization adds a profit and the manufacturer has to make his. So there are about four or five profits added to the actual manufacturing cost.

About two years ago I got to figuring. There are five good reasons why Stainless Steel is the kind of cookware that should be in every home. 1. It washes as easy as a drinking glass. No scouring, scraping or scrubbing. 2. It doesn't rust or corrode—and it doesn't stain. 3. It doesn't affect the taste of food. 4. Carlton Ware enables you to prepare food by the method called "waterless cooking" which keeps more of the natural minerals and vitamins in your food and makes the food taste better. 5. Buy it once and you're all through buying for life. You **can't** wear it out.

You see, Stainless Steel is not a coated or plated metal, like chromium plate on the bumper of your car. That chromium plate can chip or wear off and exposes the raw steel underneath. Then the steel rusts. But our kind of Stainless Steel is stainless **all the way through.** It can't chip, crack, peel, or wear off. You could use a set the rest of your lifetime and then give it to your children and it would still be good for **their** children.

Well, I figured that if the price was low enough every family could afford Stainless Steel Carlton Ware. So I worked out this plan! We would sell a complete set of 15 pieces at a figure that would include our profit. Then you add your profit and re-sell this set to your friends and neighbors for just about half of the usual price charged on the "party plan." They are glad to get such a bargain and they feel that you've done them a real favor.

The plan becomes like an endless chain. When a woman gets her first piece of Carlton Ware she gets so thrilled with its better cooking and easy cleaning that she talks and talks. She can't wait to demonstrate it to her friends and tell them all about it. She's so proud of its silvery sheen that she just "bubbles over." So just by letting **your own friends** in on a good thing, before you know it **their** friends call you up and ask if you can get the same low prices for them. Then **their** friends call you and their **friends' friends.** It goes on and on!

To make an extra $125.00 a month, you only have to deliver seven sets and that's easy. Mrs. Montell in Pennsylvania took orders for $1400.00 worth in her first month. And Mrs. William Hanchow wrote, "Got my set Saturday—I already have 17 customers."

Now, I'll let you in on another part of my plan. If you take only ten set orders a month for six months my company pays your expenses for a winter vacation in Florida. We maintain a beautiful resort in the Florida Keys just so our sales representatives can enjoy a Florida vacation at company expense.

Get all the information right now. I'll not only be glad to send Free Information, I'll also send you a complete demonstrating outfit that you can show to your friends and neighbors. And I'll give you exact instructions by which you can write up orders without ever trying to "sell" and without making any house-to-house calls.

Everything I send you is free. When you qualify, I'll even furnish you with a complete 15-piece set of Carlton Ware to use in your own kitchen and show to your friends. It's an extra bonus I give to encourage good earnings on your part.

Send your name today in confidence. You'll be glad you wrote. This ad may not appear in this magazine again, so don't take any chances on losing out. Send the coupon or just send your name on a postcard. I won't send any salesmen to call on you and you won't be under the slightest obligation.

F. T. Strong

Carlton of Carrollton *Carrollton, Ohio*

F. T. Strong, Carlton of Carrollton
Carrollton, Ohio

Dear Mr. Strong: Please send me free and without any obligation a complete selling and demonstrating outfit with exact instructions for making an extra $125 a month. I don't want to do any house-to-house selling, but I will show your products to my friends and give them the advantage of the low prices.

Name .....

Address .....

City..... *Zone*....*State*.....

☐ I am already selling Cookware and am interested in getting a line that can be sold at a lower price. Please send me your Distributor's proposition.

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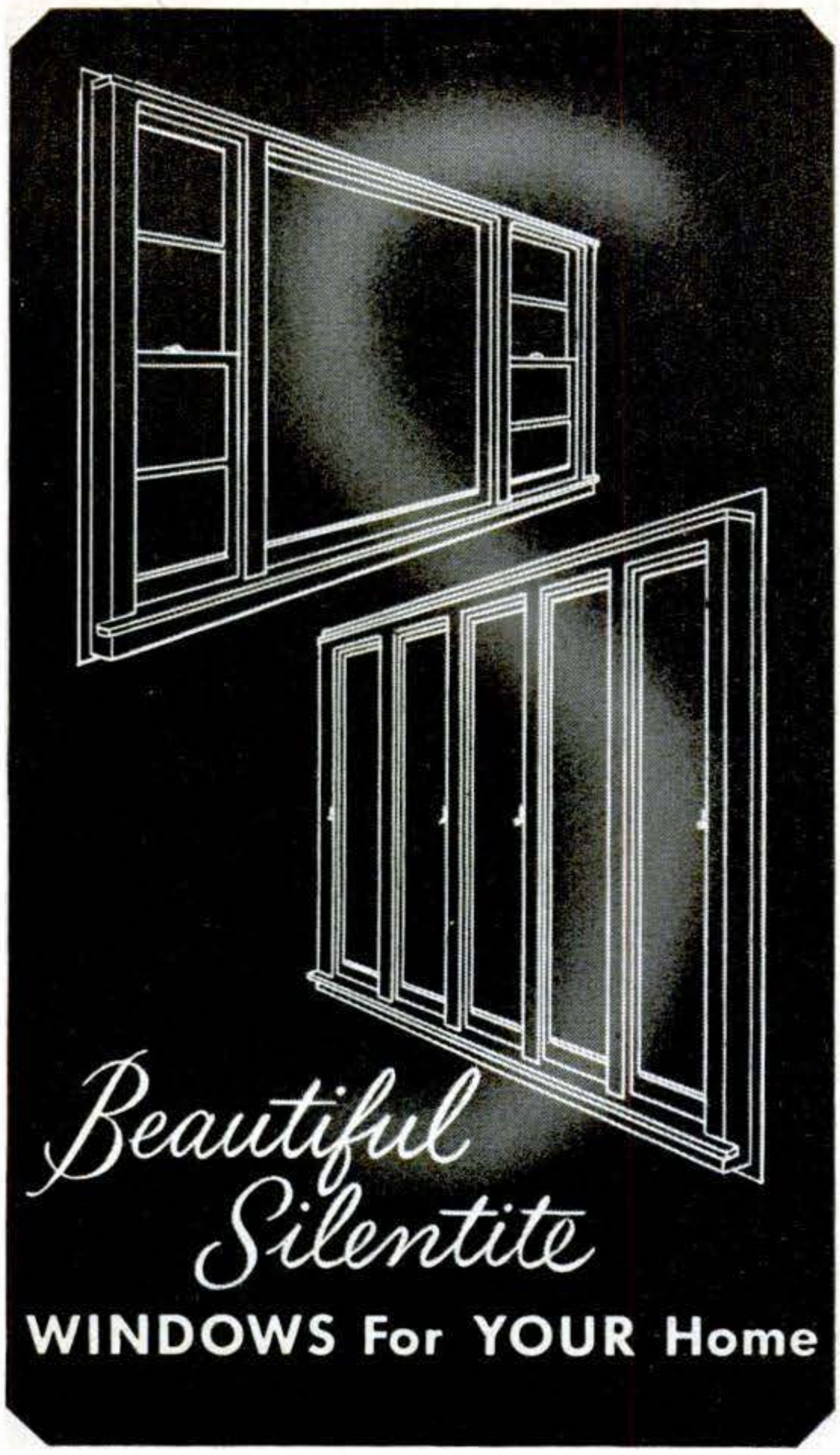

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650-16	5.55	700-15	4.50	650-20	7.85	32x6(10)	9.85
700-16	5.00	670-15	4.45	700-20	8.45	900-20	13.15
650-15	4.35	710-15	4.65	750-20	8.55	1000-20	13.75
760-15	4.95	550-17	4.45	825-20	14.65	1100-20	13.85

EXTRA SPECIAL 30 MONTH WRITTEN GUARANTEE

600-16	$5.35	475-19	$4.85	700-15(6)	$8.95	700-20	$11.05
600-16(6)	6.45	640-15	5.05	750-16(8)	10.75	750-20(10)	15.45
650-16	5.85	670-15	5.55	700-17	9.95	750-20(8)	15.05
650-16(6)	7.35	710-15	5.75	750-17	11.75	825-20	18.35
700-16	6.45	760-15	6.05	750-15	13.95	900-20	17.25
750-16	9.25	800-15	6.55	825-15	12.95	1000-20	17.75
525-18	5.00	820-15	6.65	600-20	8.75	1100-20	19.55
550-17	4.95	670-16	6.35	650-20	10.25	1000-22	19.45
650-15	5.35	760-16	7.15	32x6(8)	11.15	1100-22	20.45
700-15	5.45	700-16(6)	7.65	32x6(10)	11.75	1200-20	29.95

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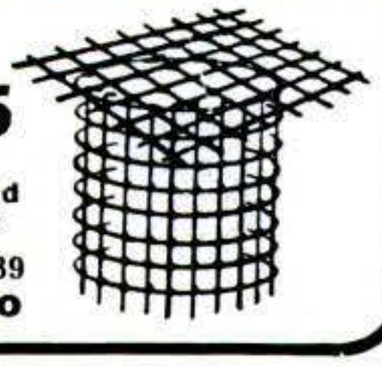

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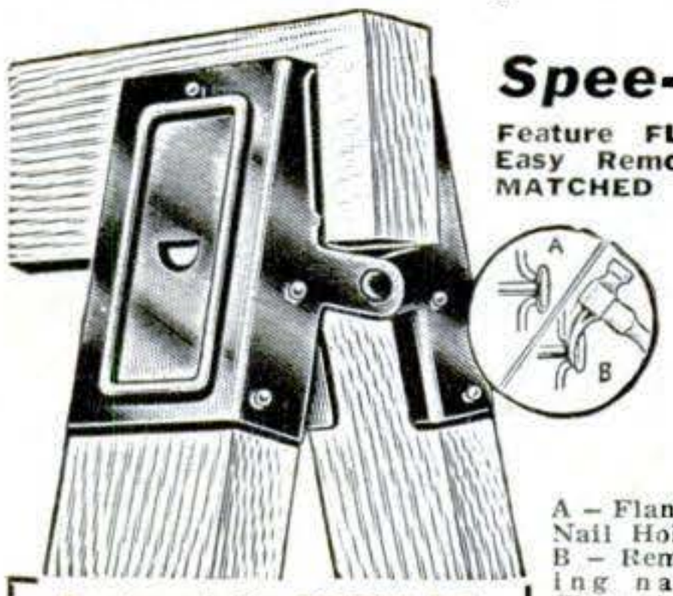

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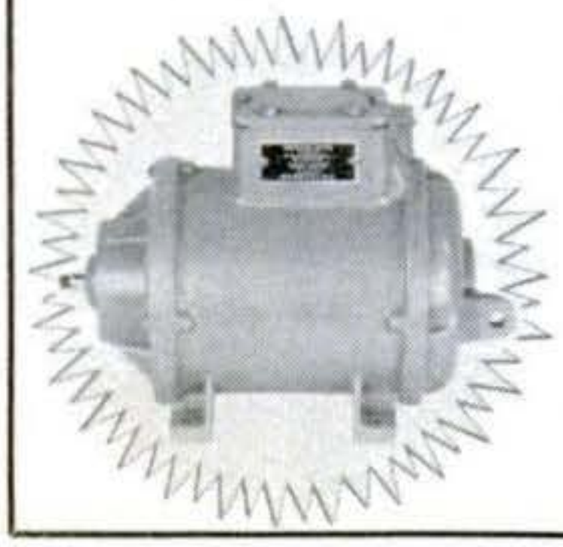

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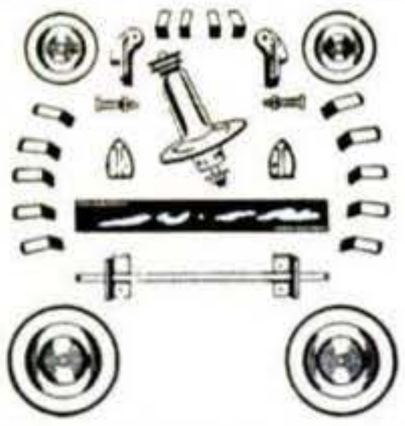

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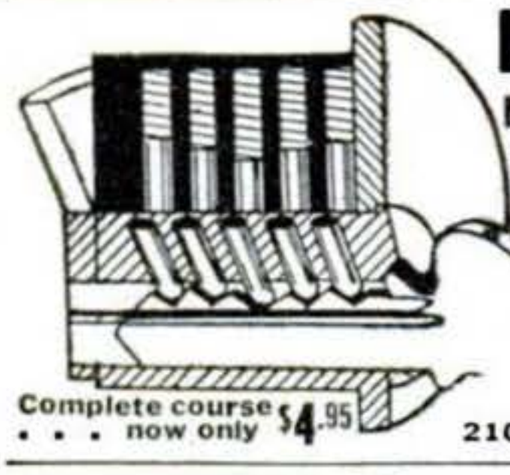

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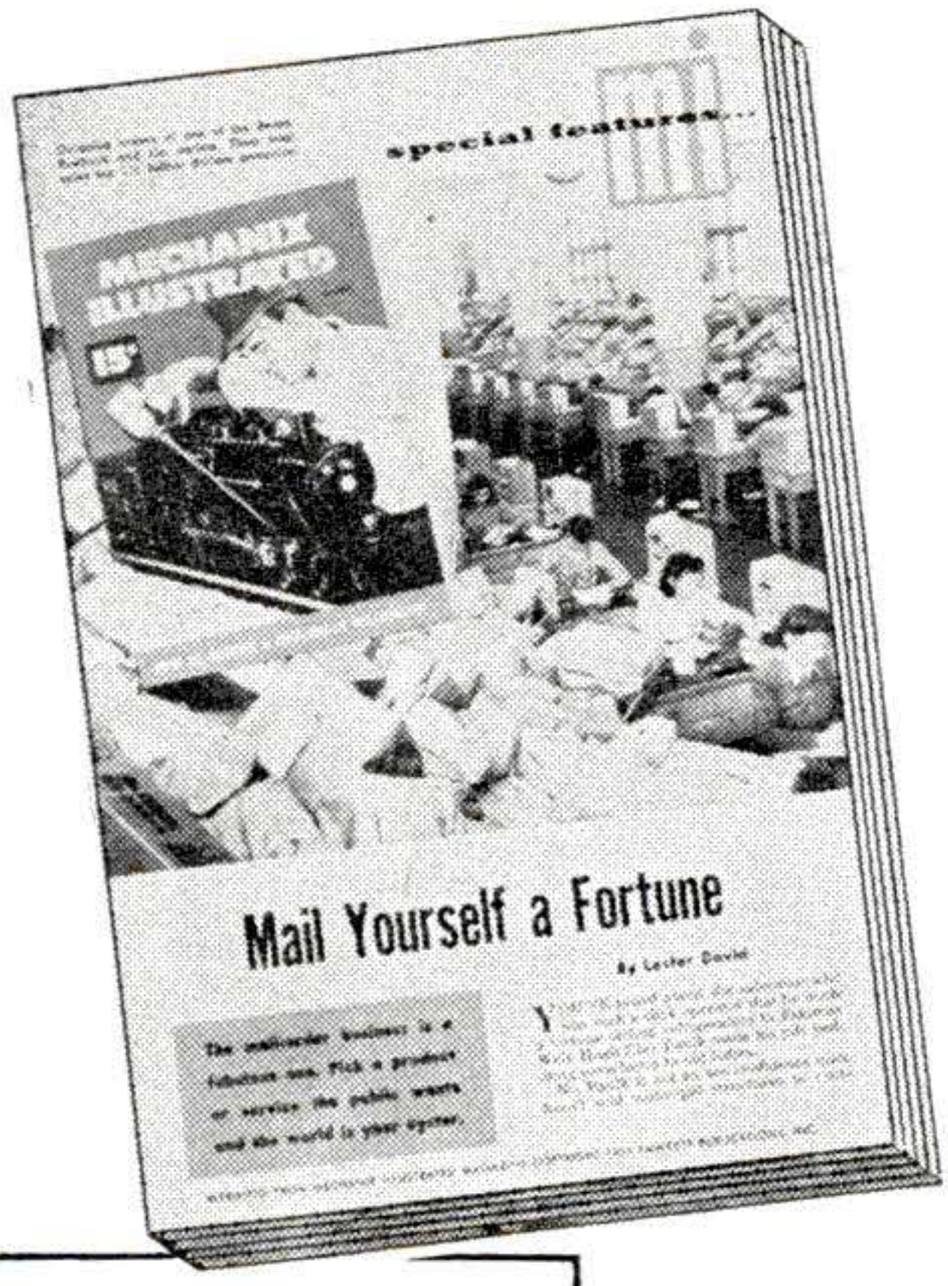

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"How to Become a Mail Order Millionaire"

Read how Gilbert on a "peanut" investment built up to $350.00 A DAY. Learn how Zimmerman started a mail order business on a buck private's pay and spiraled $16.80 into a big yearly income. See how a Chicago clerk quit a $75.00 job and now makes $22,000 a year in his own Mail Order Business. Read how a southern boy made a fortune selling war-surplus parachutes which he bought as he went along. All Free! Send name on coupon for a copy of this fascinating reprint of "How to Become a Mail Order Millionaire" from Mechanix Illustrated plus details on the L.W. Mail Order Survey.

Start on a SHOESTRING!

The real-life stories of success in Mail Order read like fairy tales. If I had not personally known these people their stories would be hard to believe. Yet they are not only true, but they represent just a few of the hundreds of "little operators" who have been swept into big money by Mail Order.

GAINES. I personally guided his start when he invented an automatic pants presser. He started with one little ad in one magazine. Four years later he retired — with enough real estate to keep him in cash income the rest of his life.

VAN MARK. I worked with him for six years. I met him when he was a wagon man for a tea and coffee house, knocking on doors. He went into Mail Order on nothing—made money from the start —ended up six years later with savings of $50,000 and an income of $5000.00 a year for life without further work.

DUGGAN. A few years ago he was a truck driver. Started fooling with Mail Order in a spare room in his spare time. Last year he said, "I don't know how much I'm worth—after you get the first million you quit keeping track."

MRS. NIXON. Started a small Mail Order business at home—just to keep occupied. It looked good and she came to me for advice. I showed her how to expand. In two years the business got so big her husband resigned his job to help manage it.

FOXMAN. Foxman worked as a hack writer at $70 a week. He had idle time in the evenings—ran an ad offering something he didn't have—got so many orders he had to find a source of supply. He made $18,000 the first year. He gives me credit for "showing the way."

JORGENSON. Consulted me about a specialty product. On my advice he ran one ad to "test" its saleability. That ad brought sales of $50,000. In his first year he did a business of nearly a half million dollars. His original investment was less than a thousand.

These things I have seen. These people I have helped to the realization of their dreams — these and hundreds of others. My own fortune was made in Mail Order. And now my secrets can be yours.

L. W.

Have you ever thought of running a profitable little sideline right from your home? Has it occurred to you that *you are just as capable as anyone else* of making money on a product or service that can be sold by mail? Have you ever looked into the Mail Order business as it's run (on tiny investments) by innumerable small operators?

Forget about Sears and Ward's! *Read about the "little fellows"* . . . clerks, teachers, vets, mechanics, salesmen and others . . . who are packing Mail Order items in bedrooms, spare rooms, attics, garages, cellars . . . dumping them in the Post Office . . . and quietly banking the fistful of Money Orders, cash and checks delivered to them daily by the mailman.

An annual business of almost a billion dollars is done by "little fellows" who advertise and sell *just one item!* The Department of Commerce of the United States says, "A number of the most successful obtain incomes as high as $40,000 to $50,000.00."

It's an incredible story . . . a story of a business that's wide-open for newcomers . . . with opportunities for income far-and-away greater than you can ordinarily hope to attain by holding down a job. And in Mail Order you can stay as small as you wish—run your deal as a $50 or $75 weekly sideline—or consider jacking it up into really big figures as a full time operation.

Glance at the examples at left. *These true stories are far from unusual.* Multiply them by the hundreds and you begin to get an idea of what can be done . . . what *is* being done...in the phenomenal Mail Order field.

* * *

Yet, if you were to jump blindly into Mail Order your chances would be slim. A peculiar brand of "know-how" is vital in this little - known, little - understood business. *This is fortunate for you.* If any Tom, Dick, or Harry would "click" in Mail Order, the field would have been overloaded years ago.

But now you have the opportunity to learn the authentic secrets of successful Mail Order operation. They are revealed for the first time, step by step, in an extraordinary new Survey . . . *the L.W. Confidential Mail Order Letters.*

This Survey is not a course—not a book—not a group of lessons. It is a simple guide that anyone can follow. It shows you how to pick the right product for Mail Order. It shows you exactly how to start a profitable business *fast*, with cash or Money Orders in the envelopes you receive. It shows how to buy your product out of the very money you get in the mail, so you don't have to tie up cash in large supplies of your product. It gives you actual examples of ads and letters, *analyzed to show how and why they make money.* It demonstrates the months to start, the time to expand, the best way to get prospects' names. It reveals from A to Z the confidential facts that have made fortunes for Mail Order operators who use them.

Mail the coupon today, or simply send your name and address on a postcard. No salesman will call. We will mail, postage prepaid, a *Free* copy of "How to Become a Mail Order Millionaire" and along with it will give you complete facts about the L.W. Mail Order Survey. Read the facts. Then decide whether you would like to spend spare time or full time in a profitable, fascinating Mail Order enterprise. If you think you would like to follow the footsteps of hundreds of others who are now making good money in this way, you can get your L.W. Survey and begin at once.

Please don't decide to write us "a little later." Send your name *now*, before you forget. This one little act might be the first step to a future of independence and wealth.

The L. W. MAIL ORDER SURVEY, Dept. 39
805 LARRABEE ST., LOS ANGELES 46, CALIF.

The L. W. MAIL ORDER SURVEY, Dept. 39
805 Larrabee St., Los Angeles 46, Calif.

Mail me a free copy of "How to Become a Mail Order Millionaire" and details about the L. W. SURVEY. It is understood there is no charge at any time, and that I am not under the slightest obligation. After reading, I will decide whether I want to use the L. W. Confidential Letters to help me start a Mail Order business at home.

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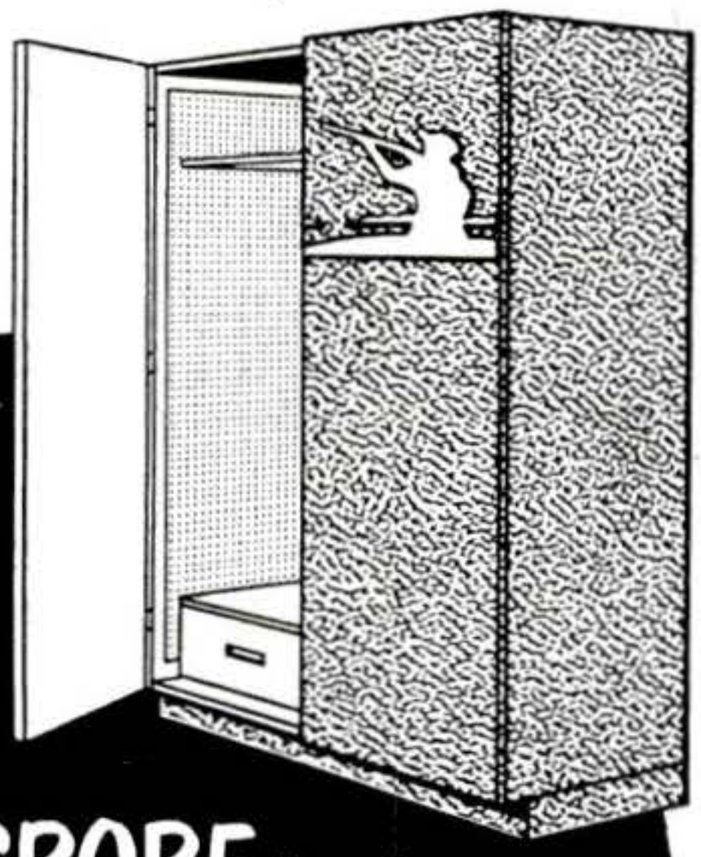

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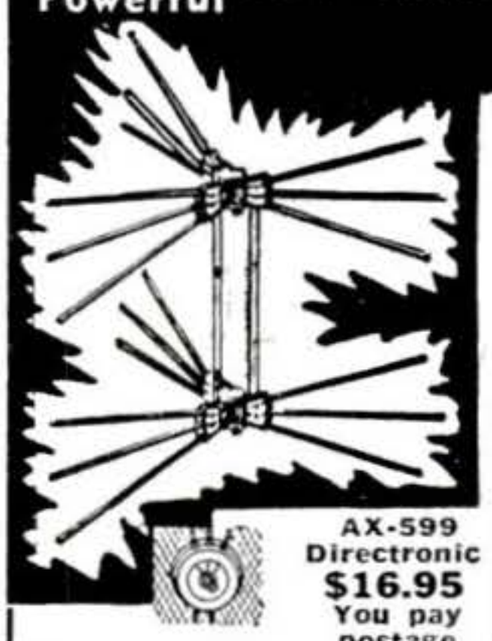

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MEN PAST 40

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Most men, if treatment is taken before malignancy has developed, can be successfully NON-SURGICALLY treated for Glandular Inflammation. If the condition is aggravated by lack of treatment, surgery may be the only chance.

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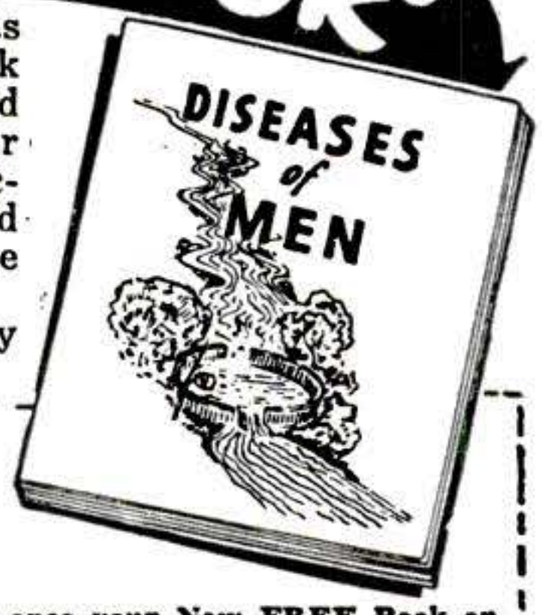

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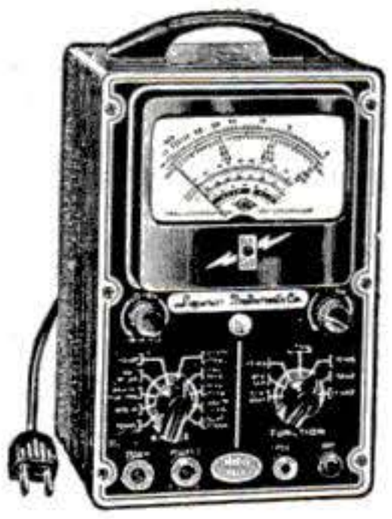

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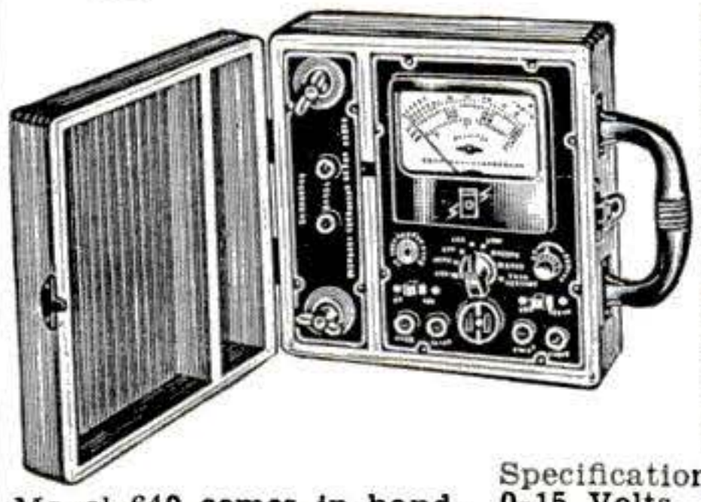

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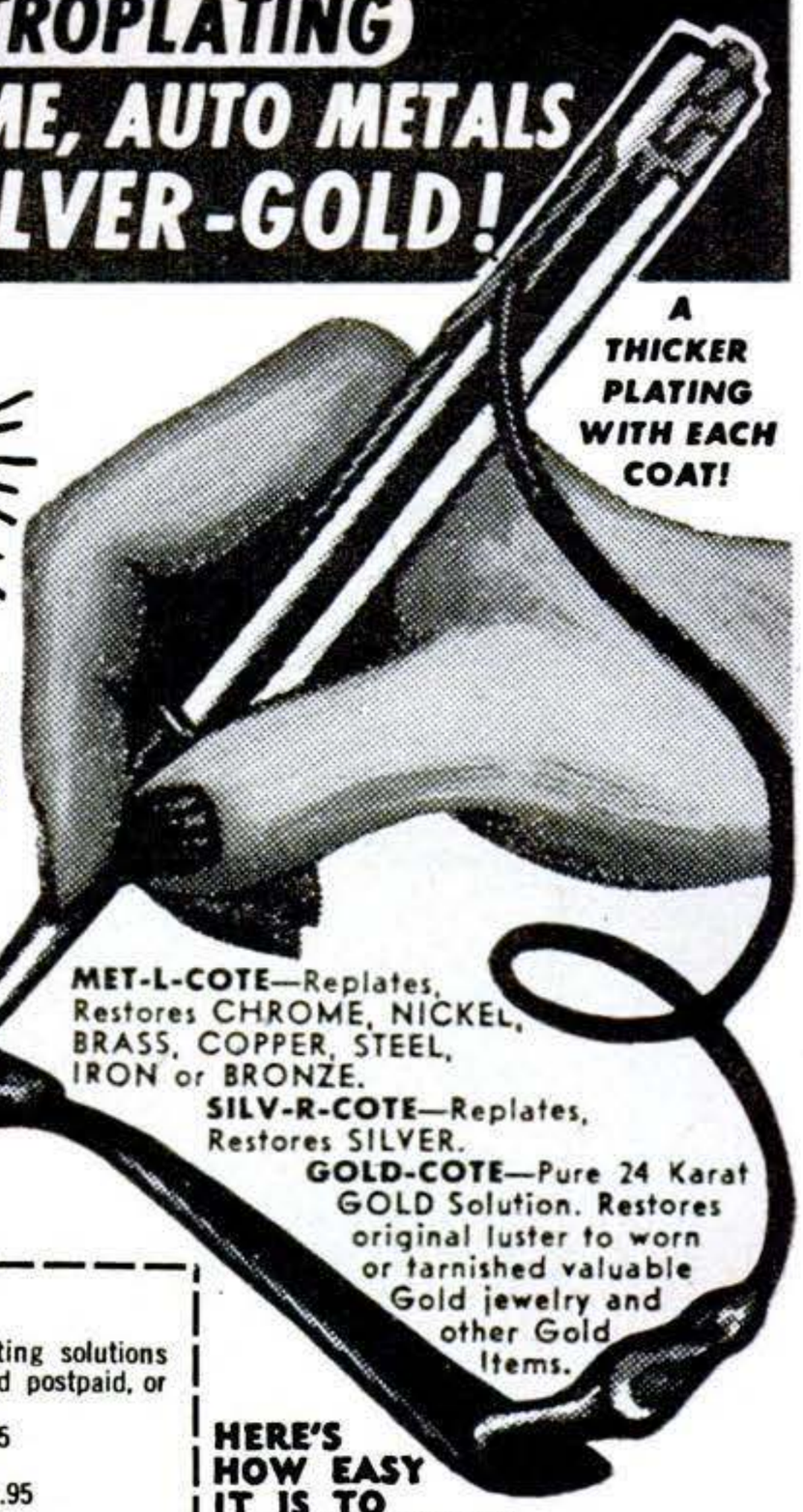

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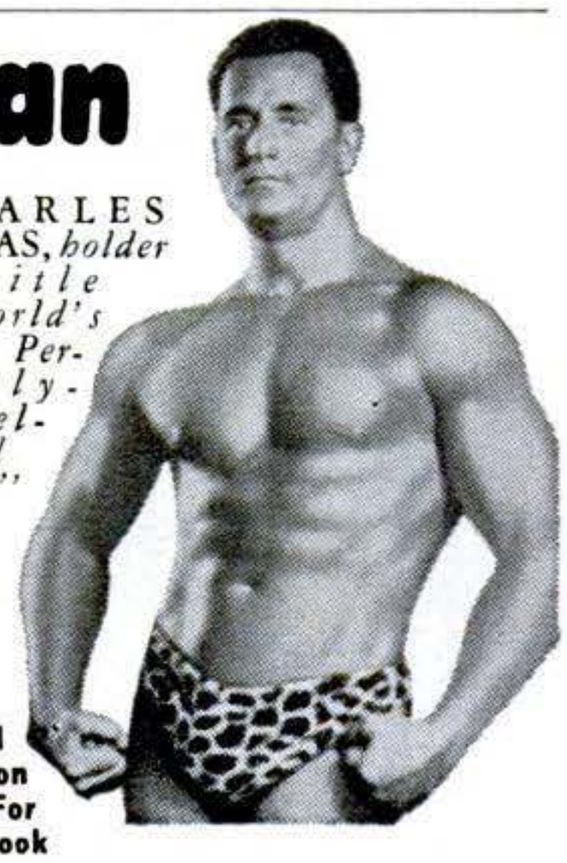

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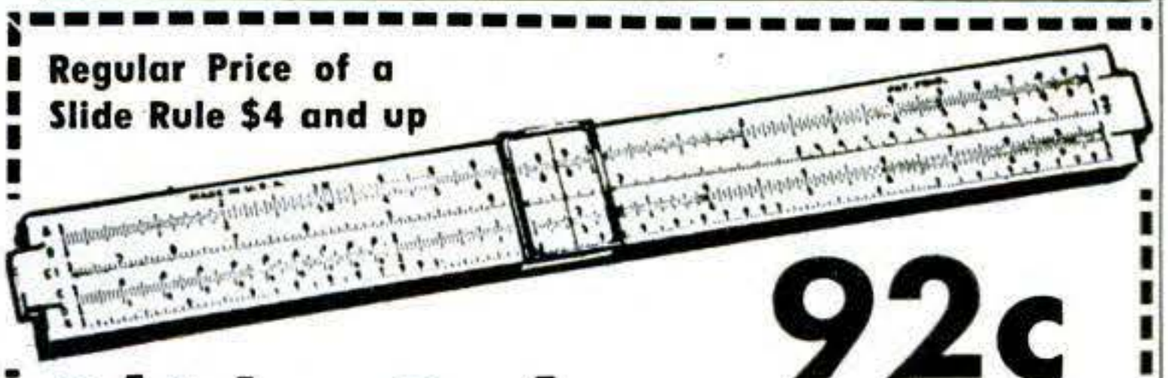

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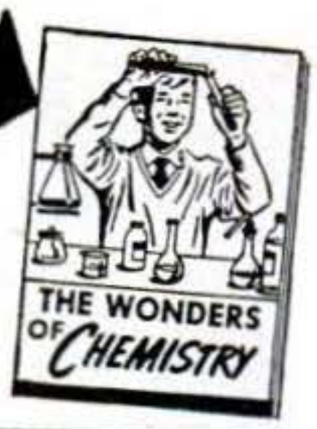

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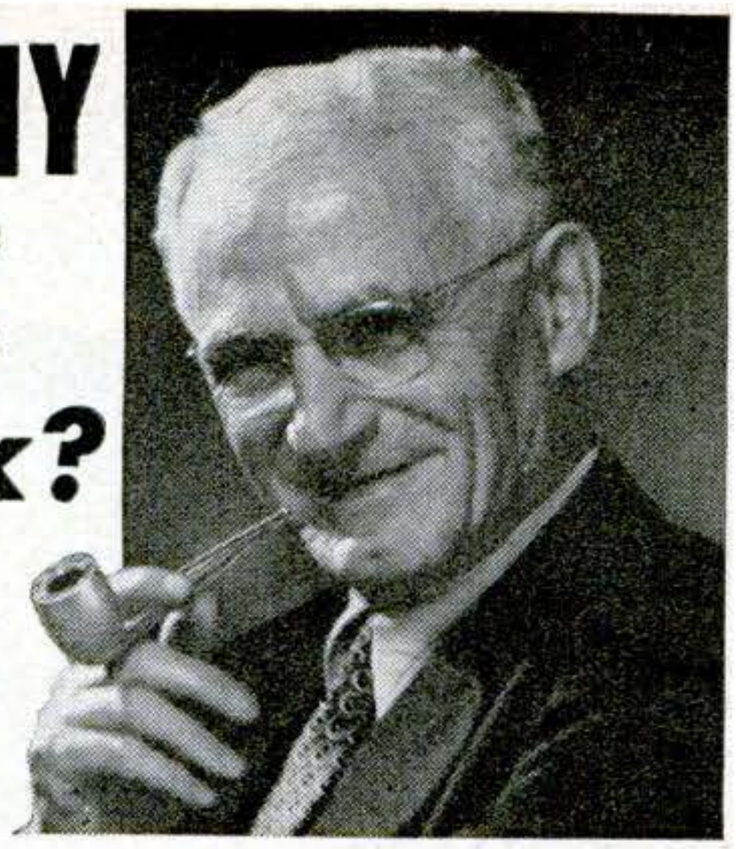

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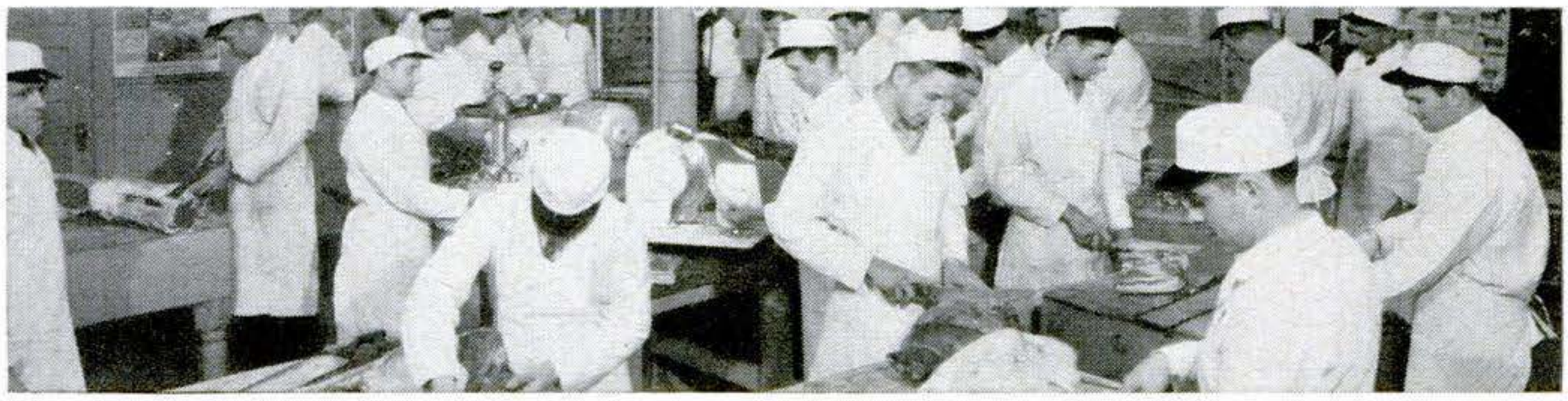

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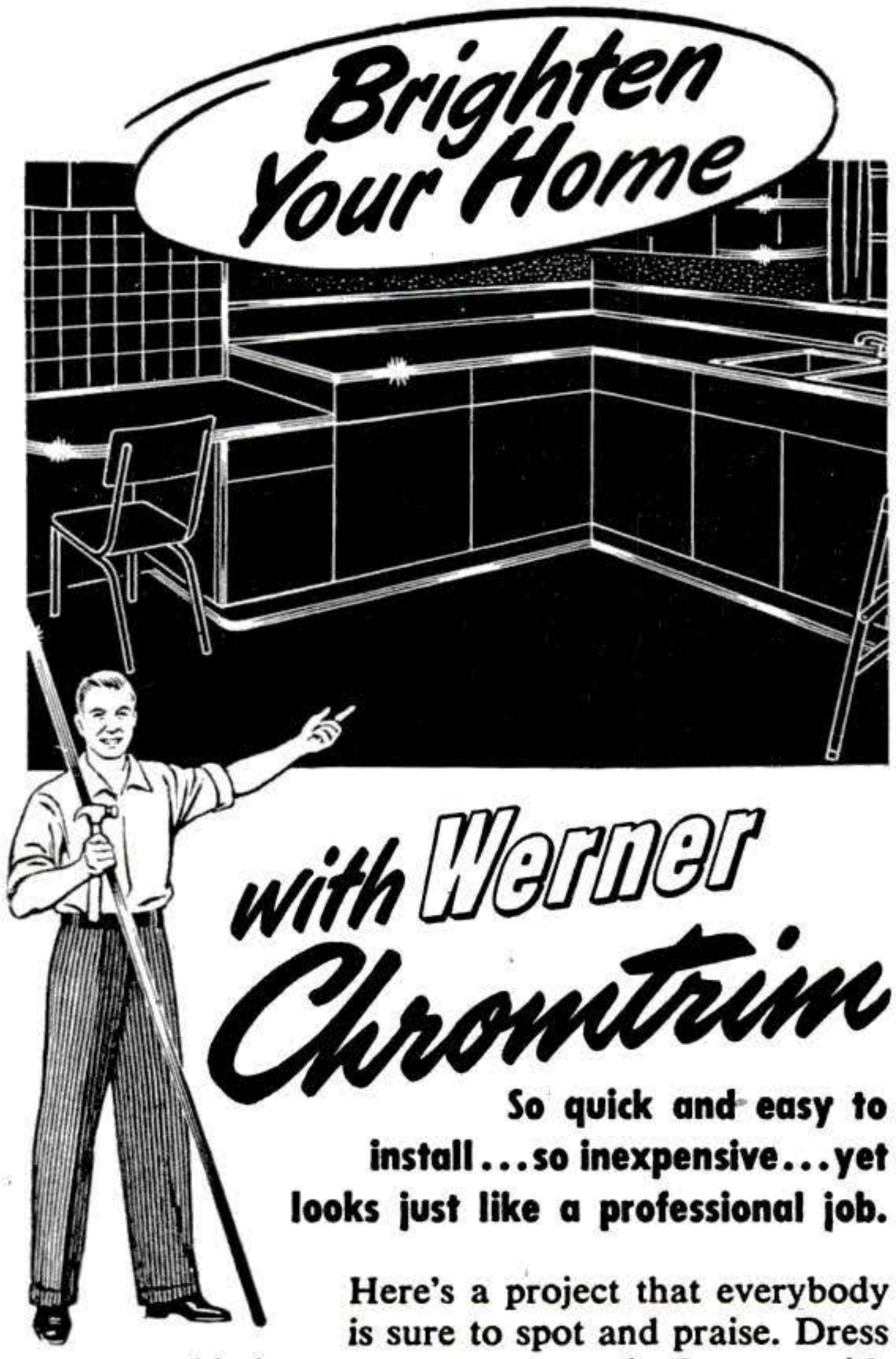

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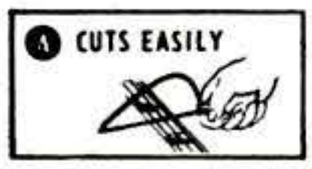

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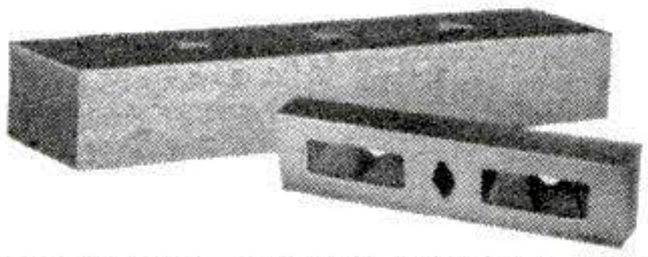

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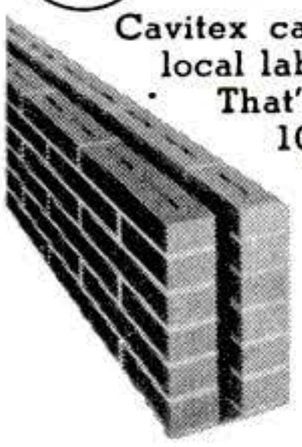

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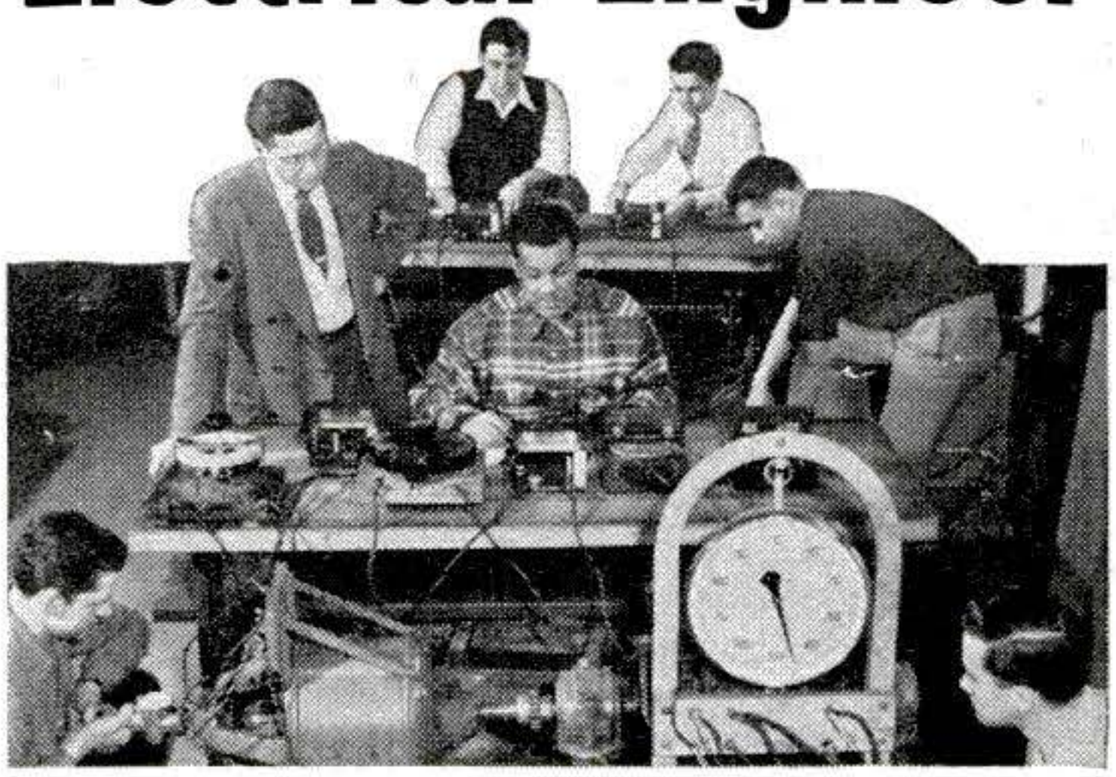

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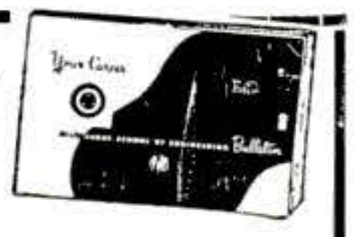

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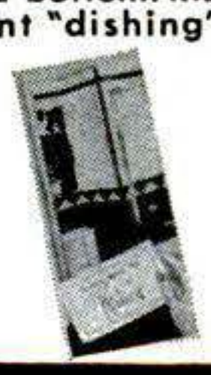

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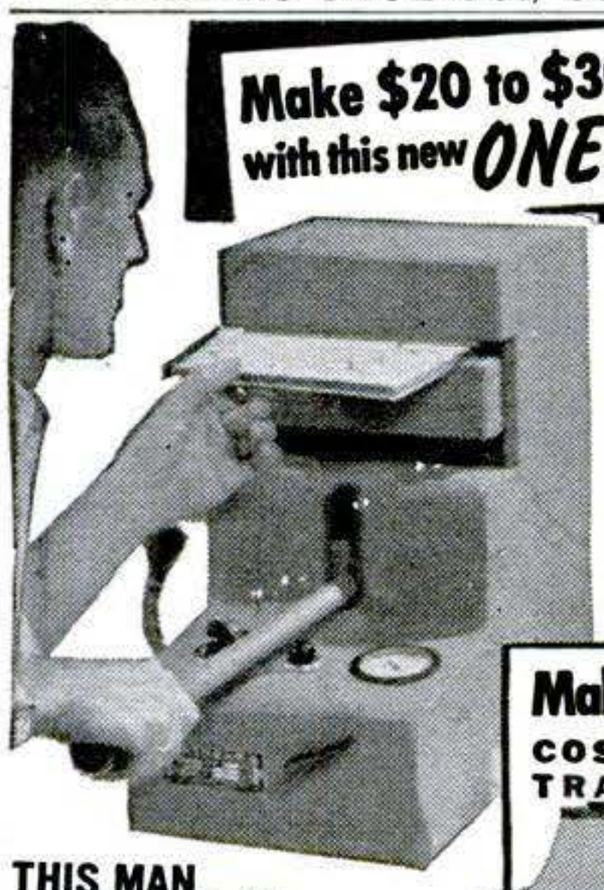

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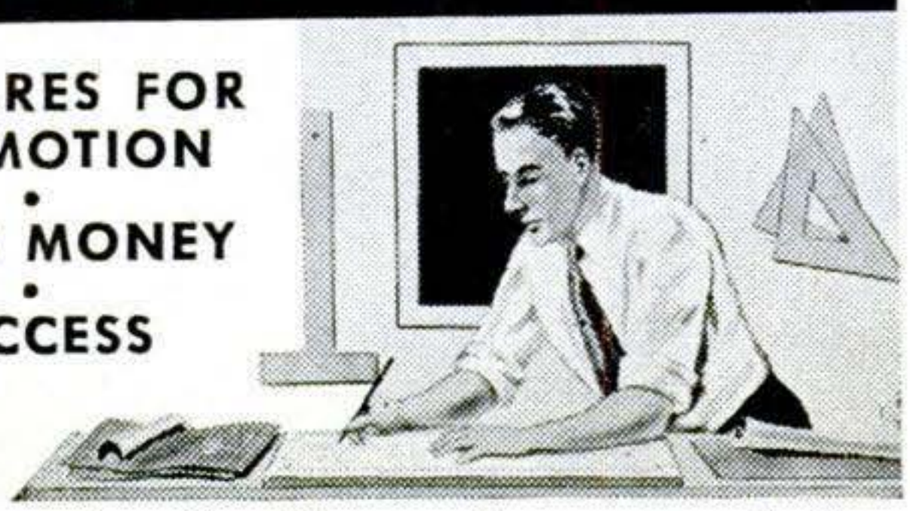

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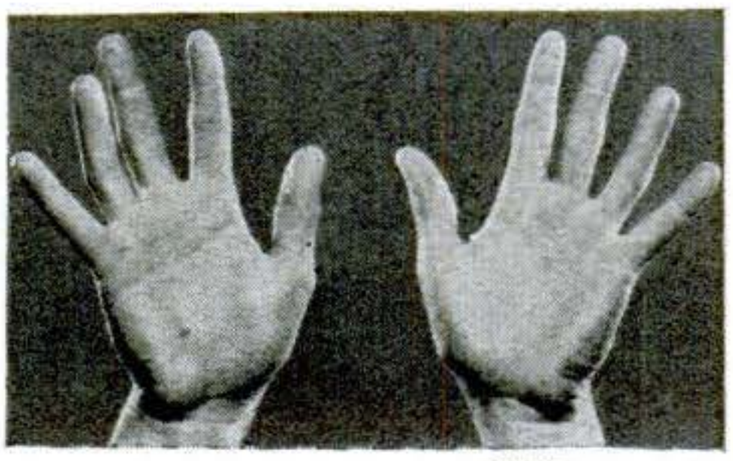

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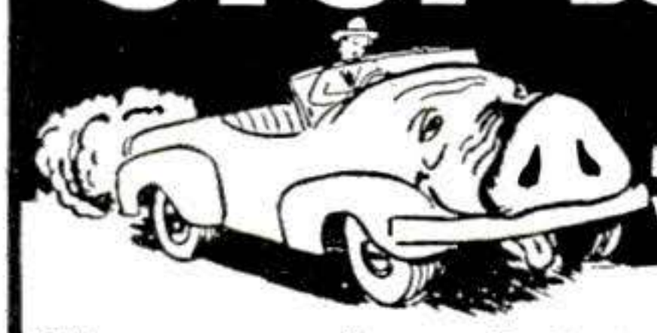

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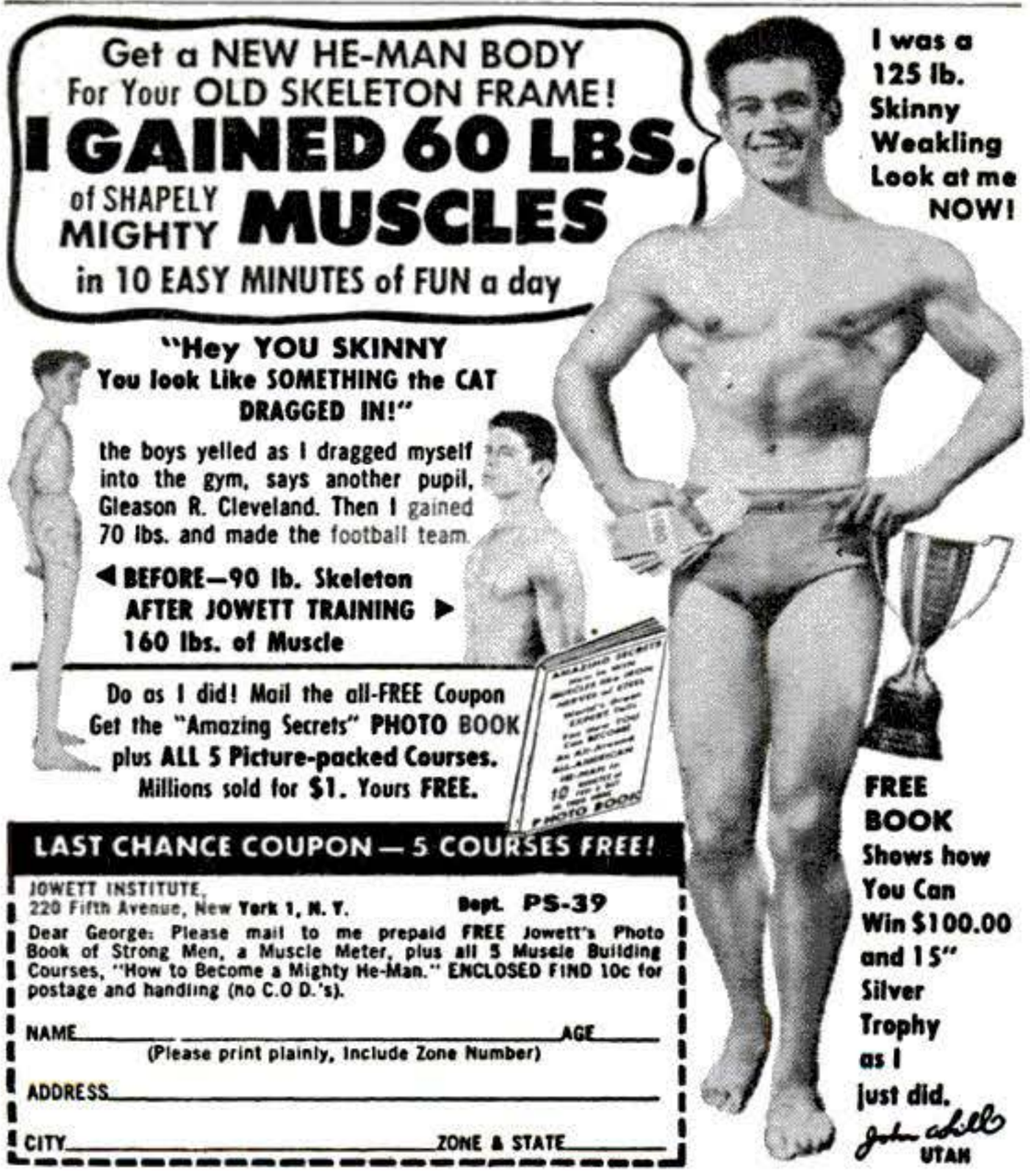

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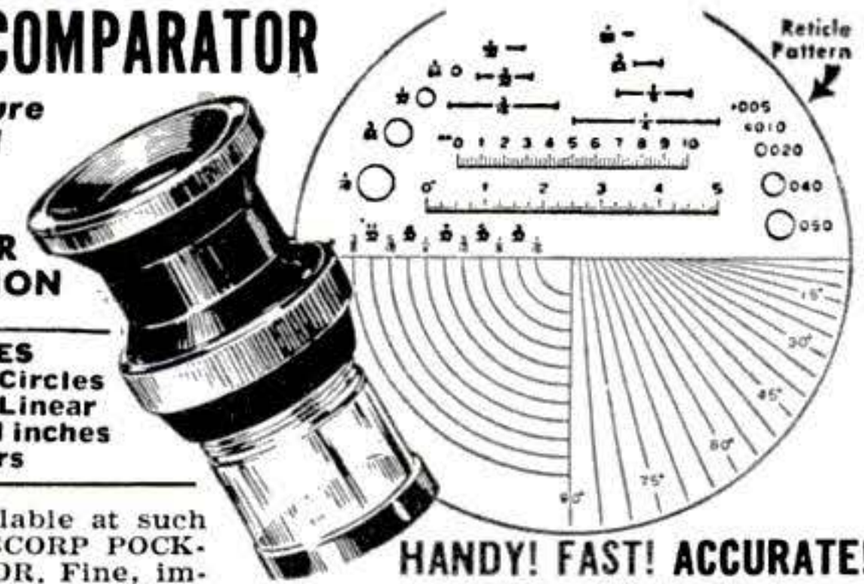

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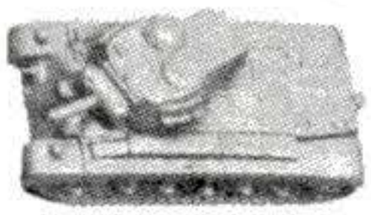

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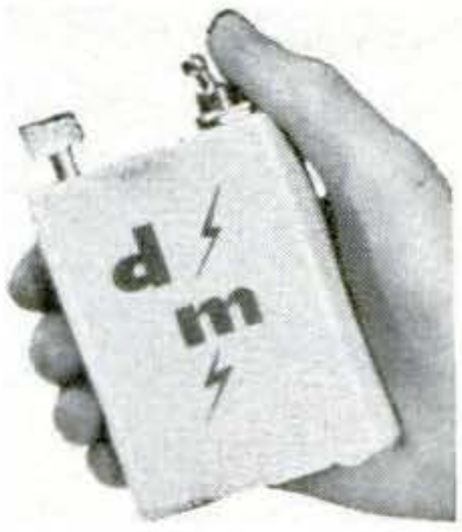

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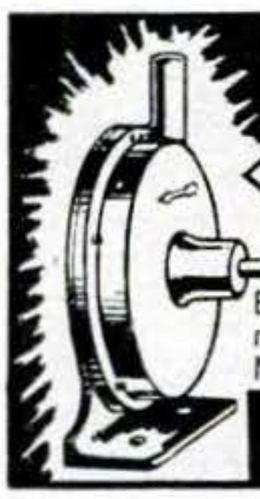

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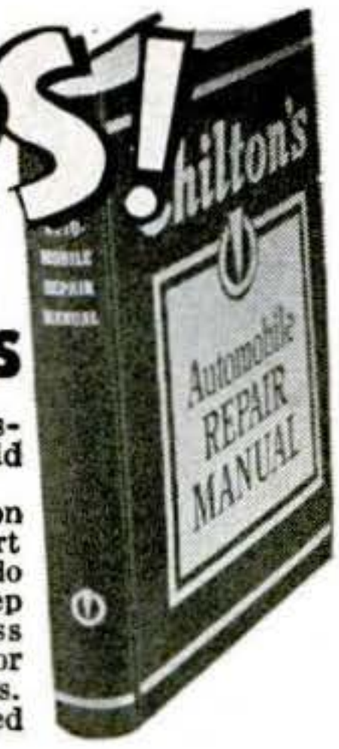

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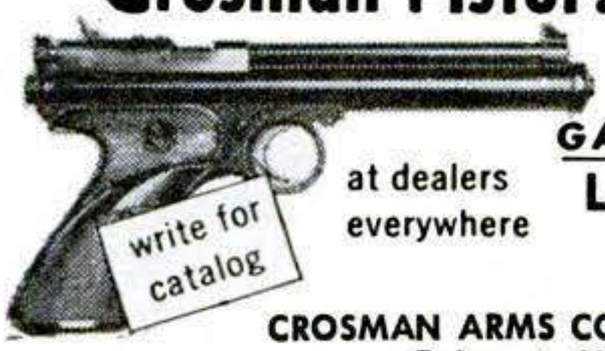

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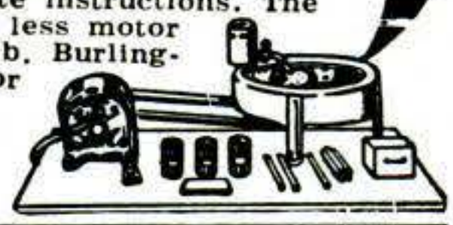

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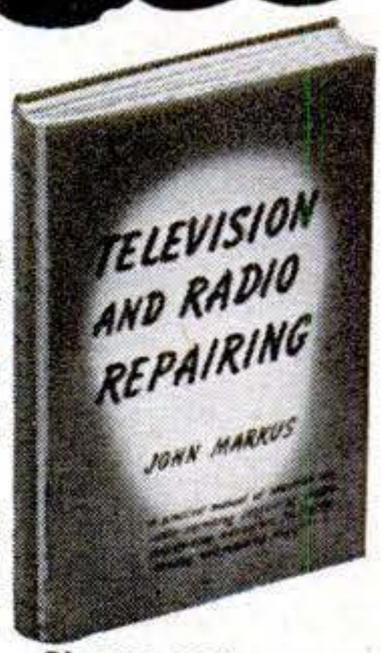

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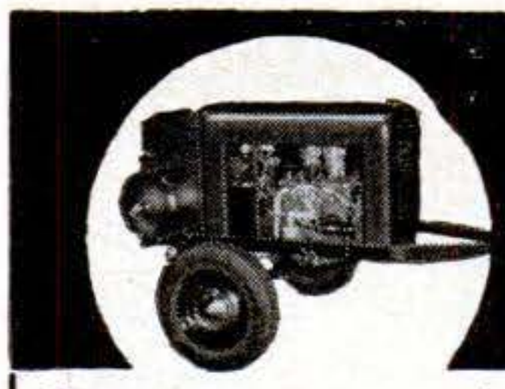

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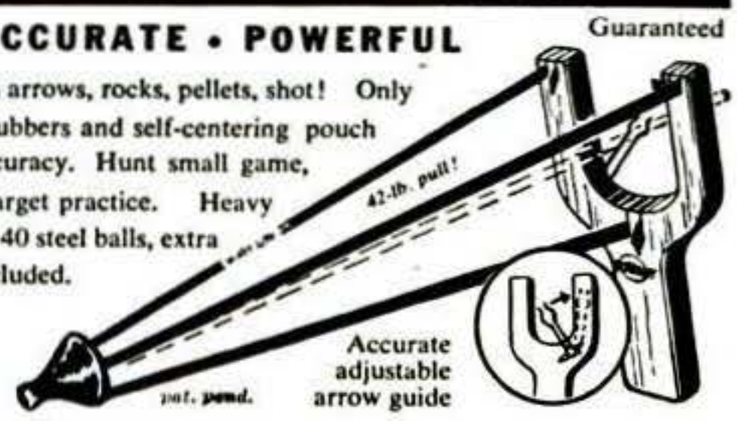

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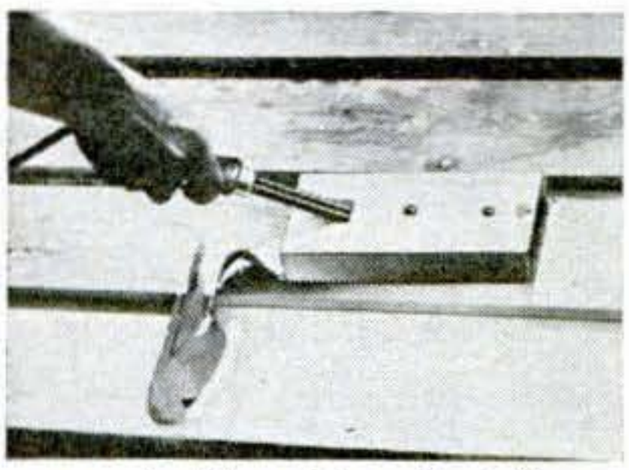

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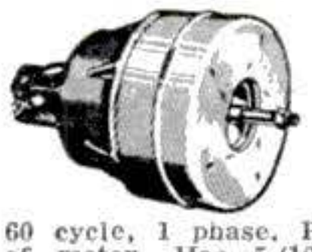

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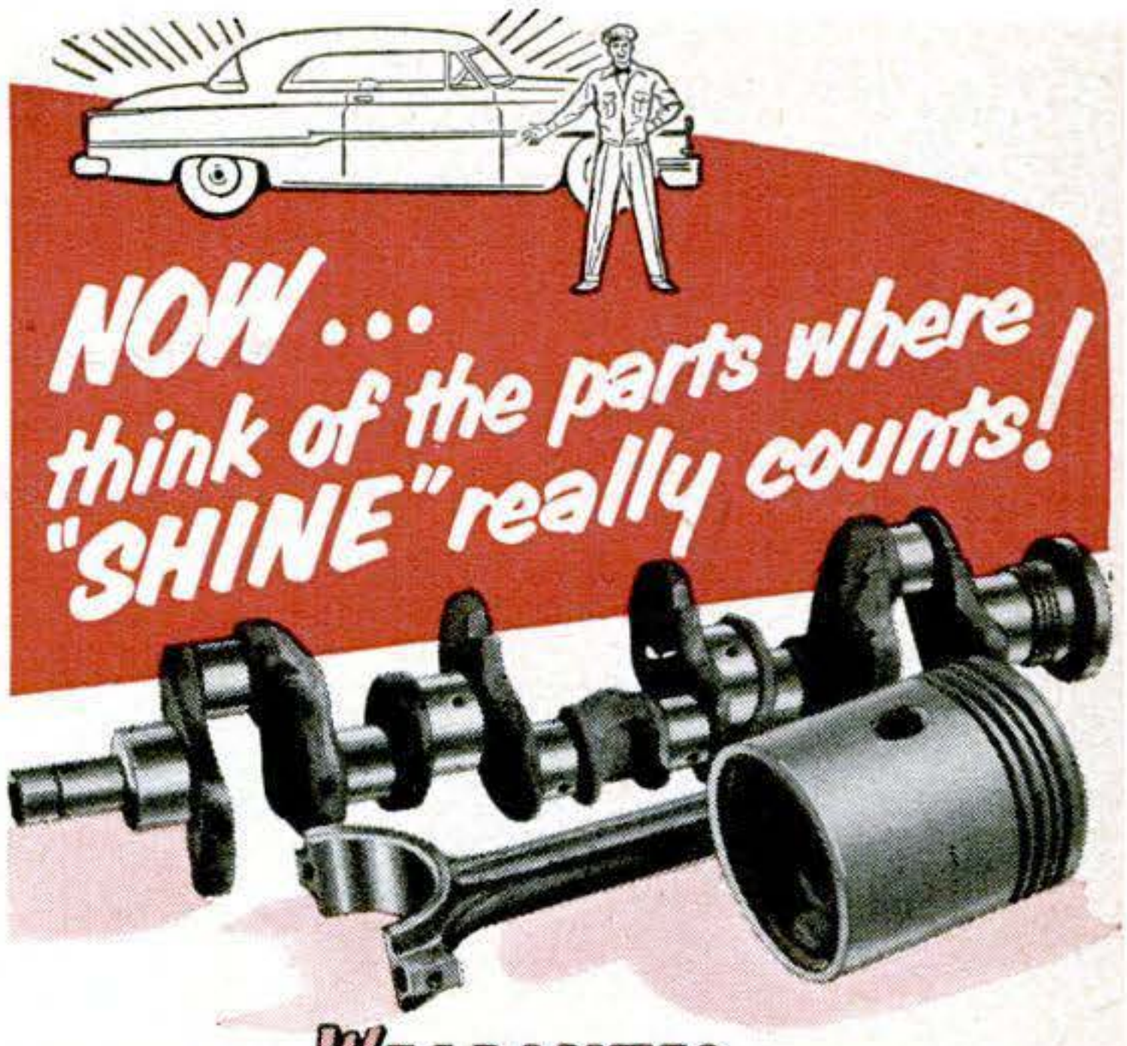

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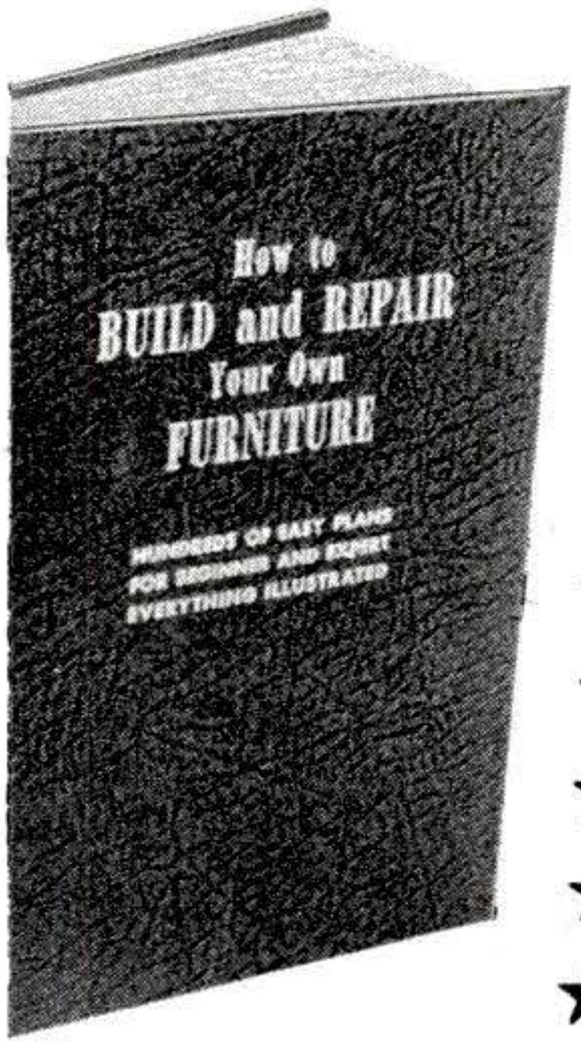

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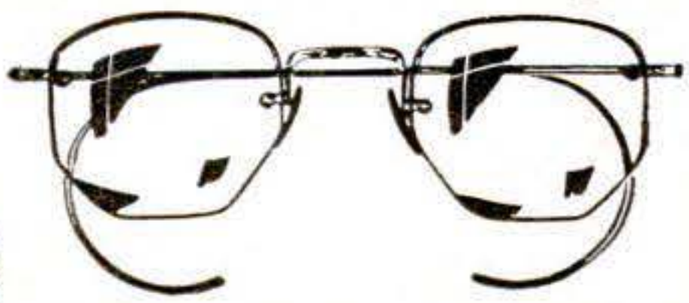

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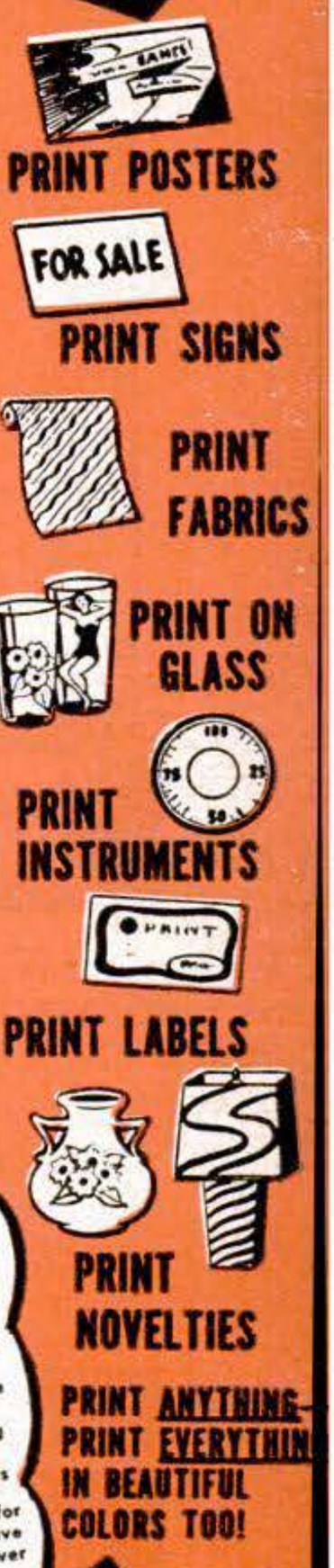

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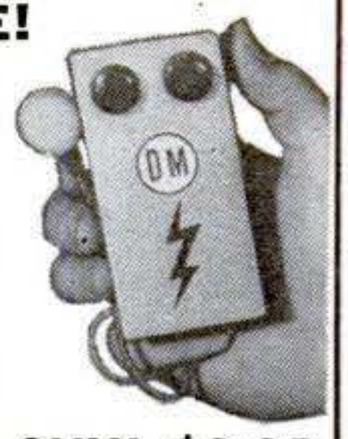

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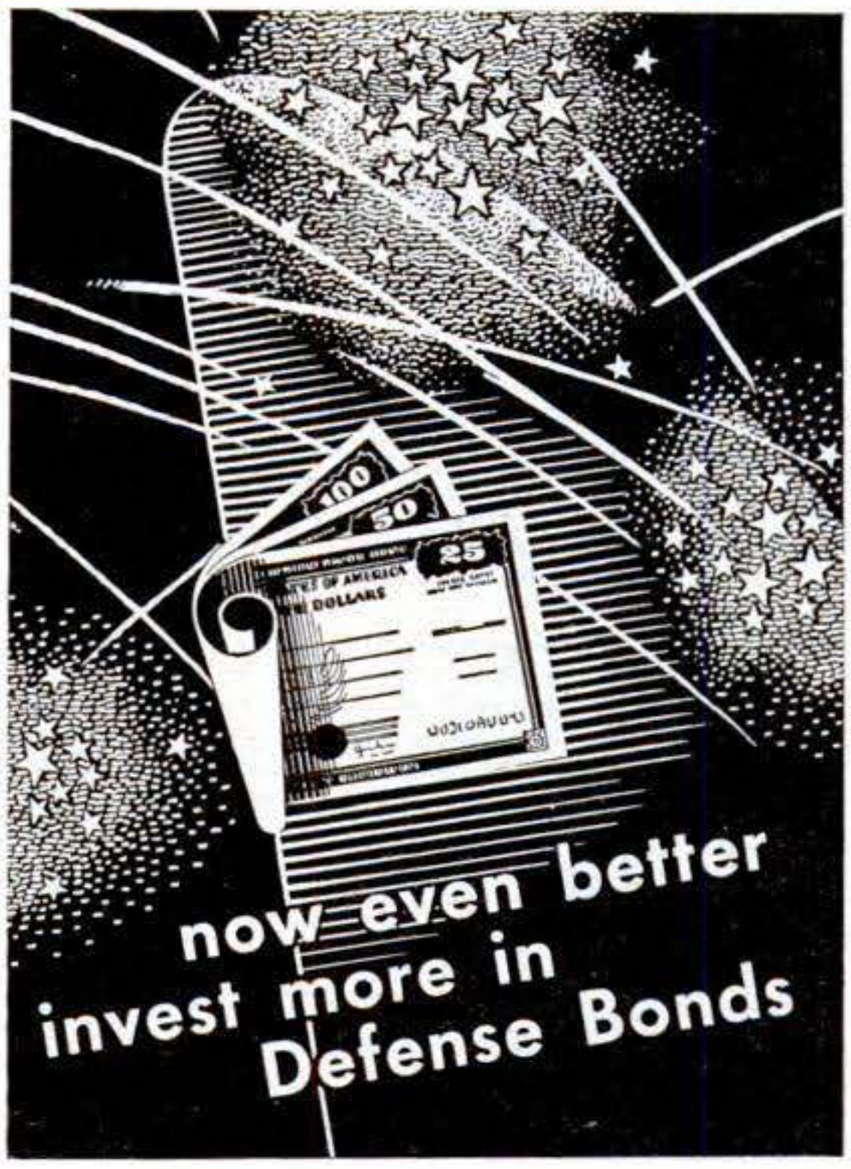

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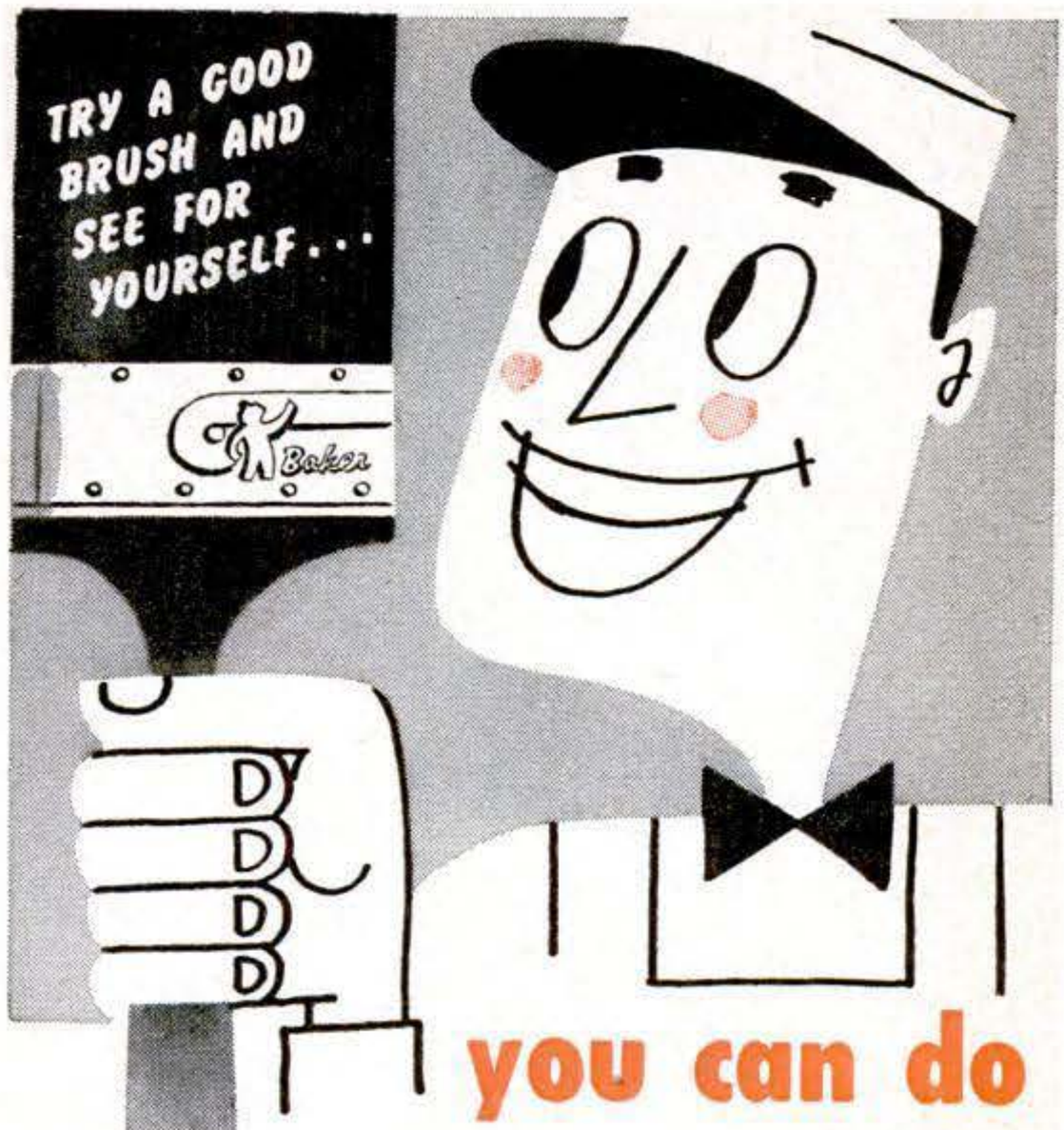

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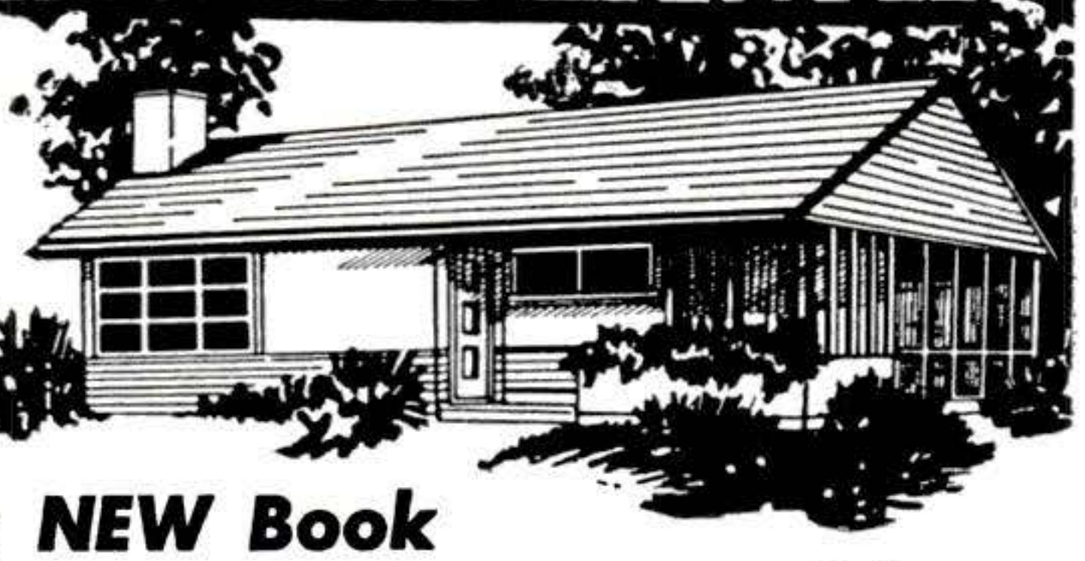

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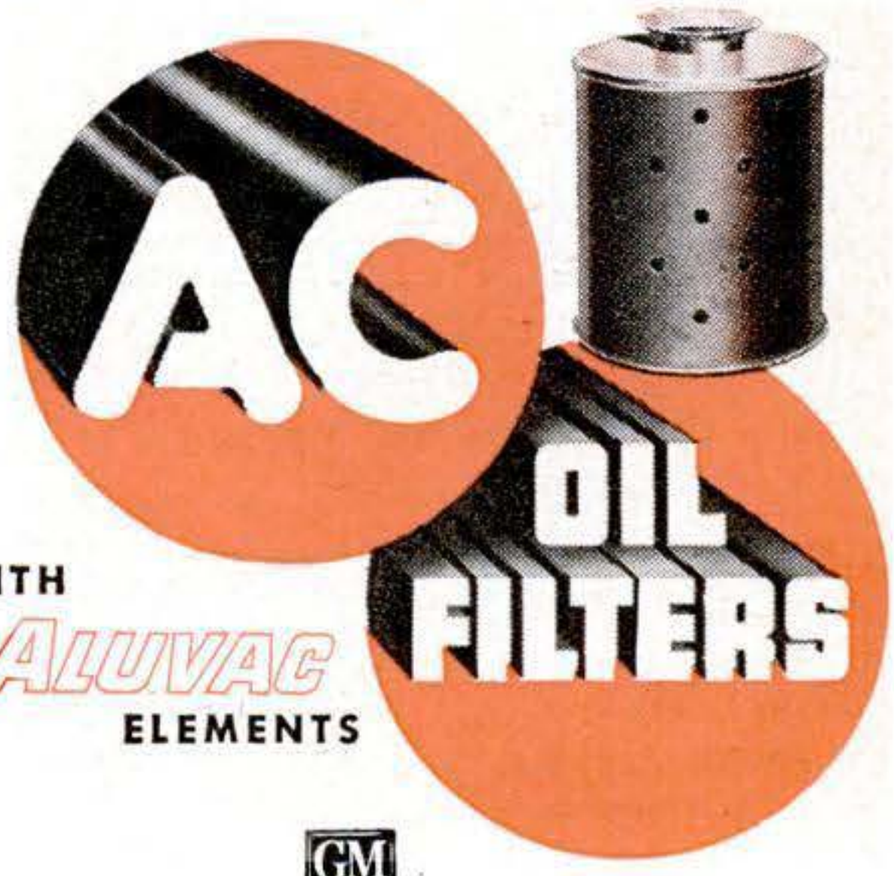

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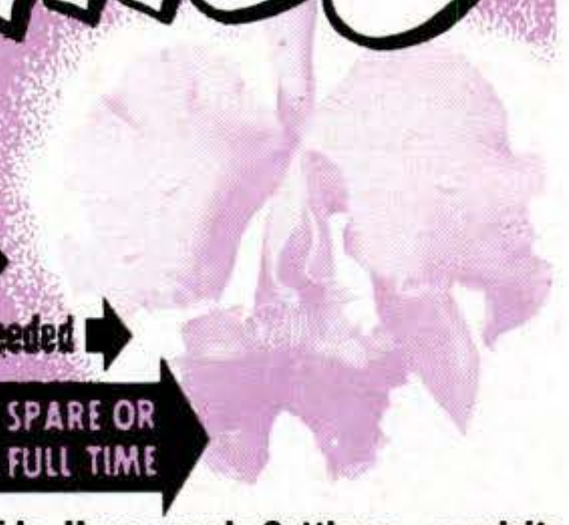

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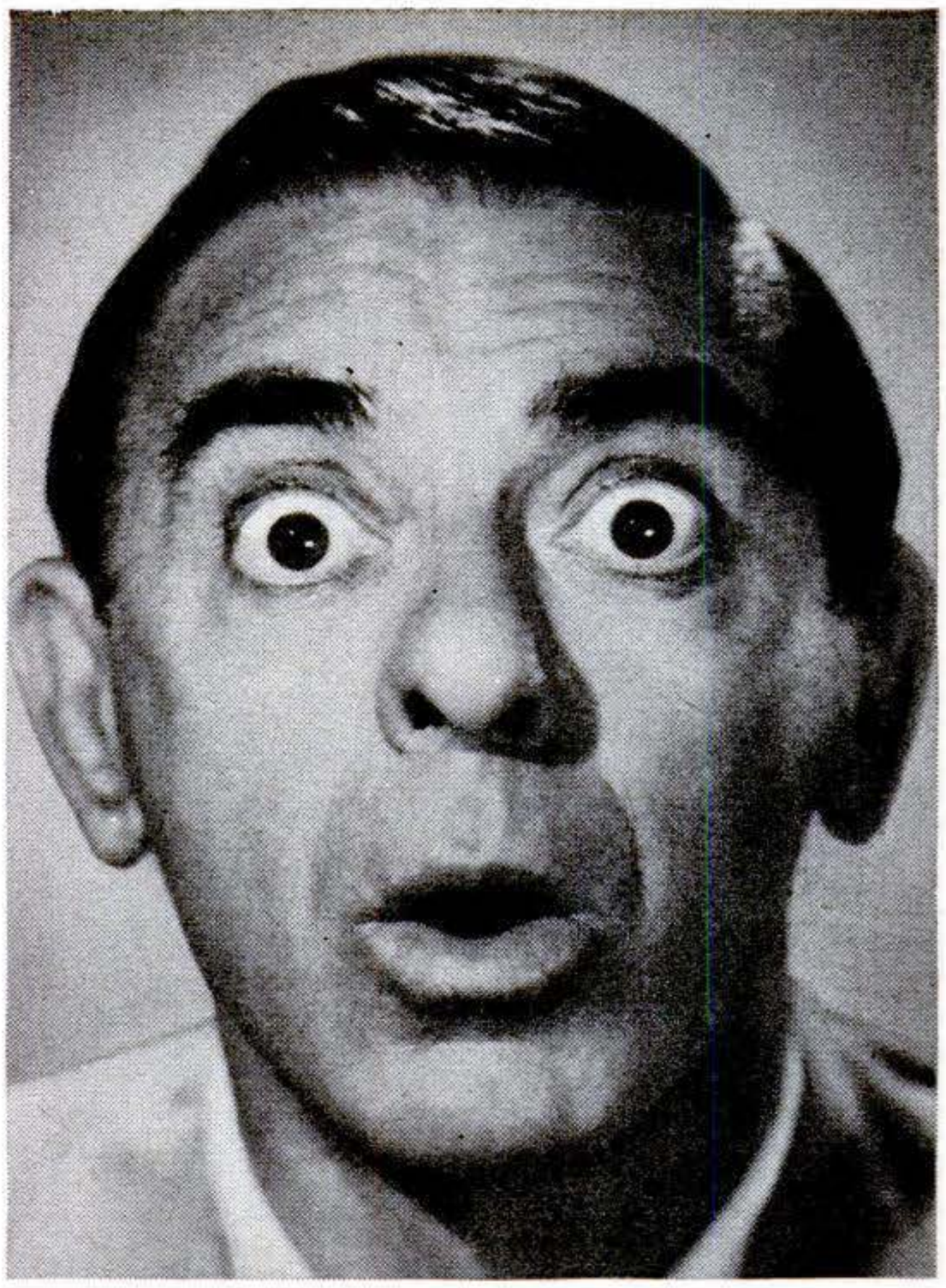

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600x16(6)	6.58	700x16(6)	7.98	600x20	9.78	900x20	18.98
640x15	5.68	750x16(6)	8.98	650x20	10.88	1000x20	19.98
650x16	5.78	800x15	6.88	700x20	12.88	1000x22	21.98
650x16(6)	6.98	820x15	7.48	32x6(8)	10.48	1100x20	20.98
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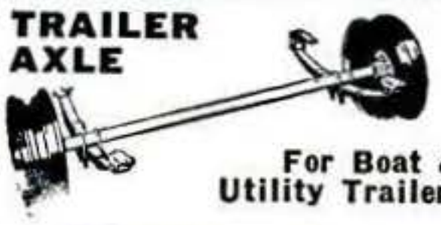

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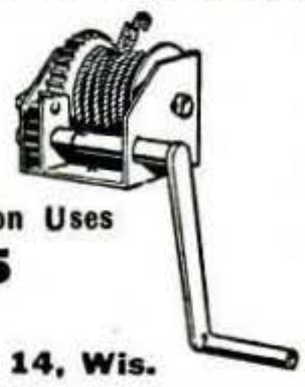

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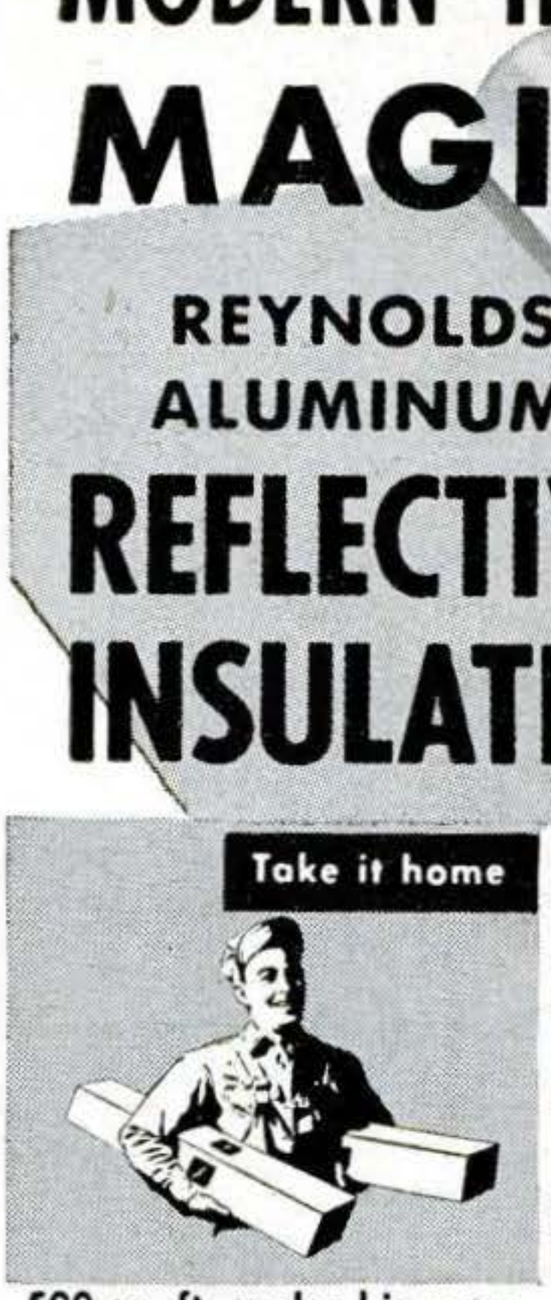

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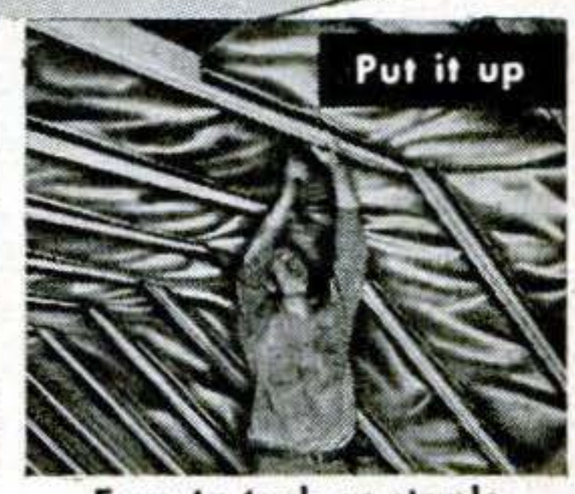

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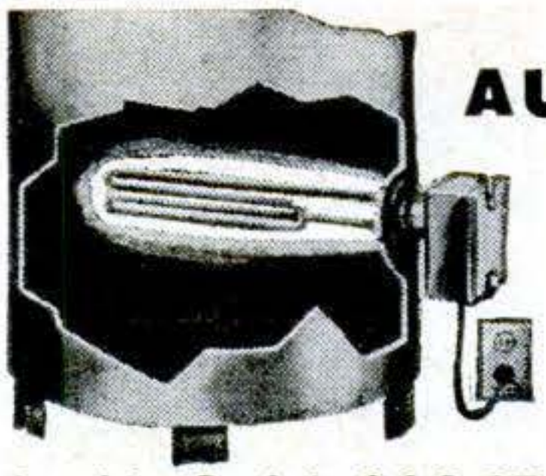

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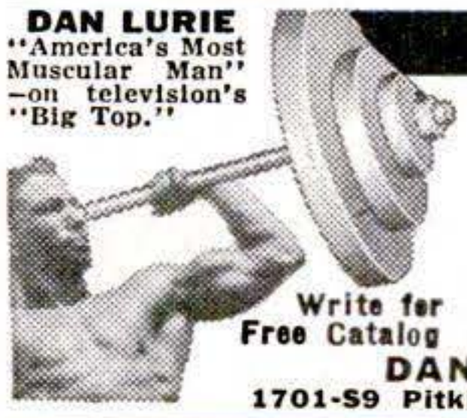

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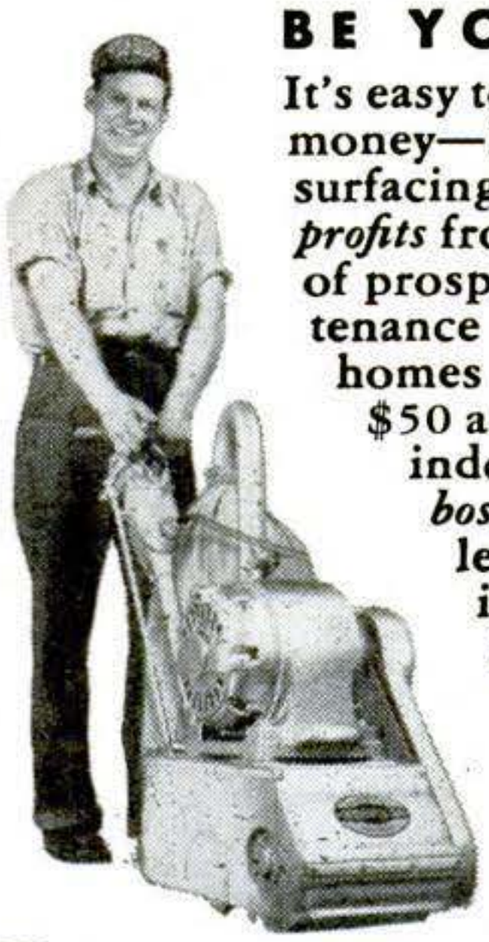

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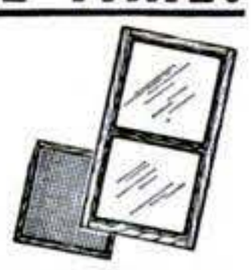

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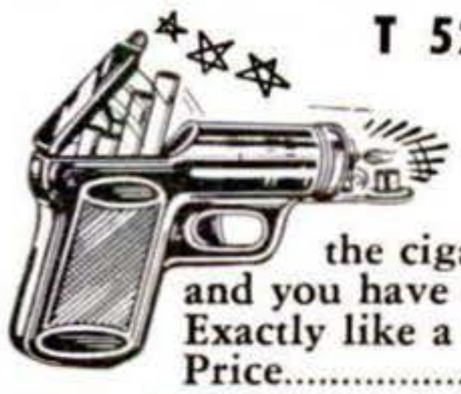

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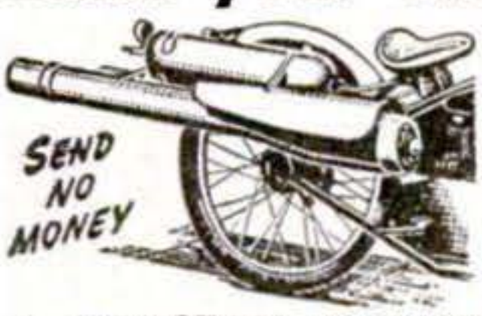

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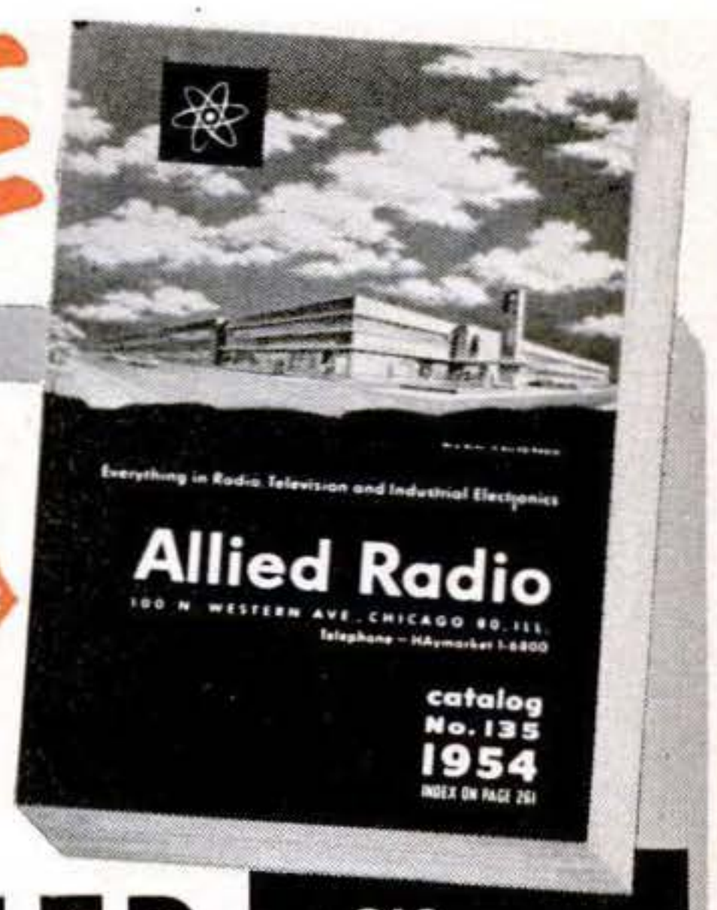

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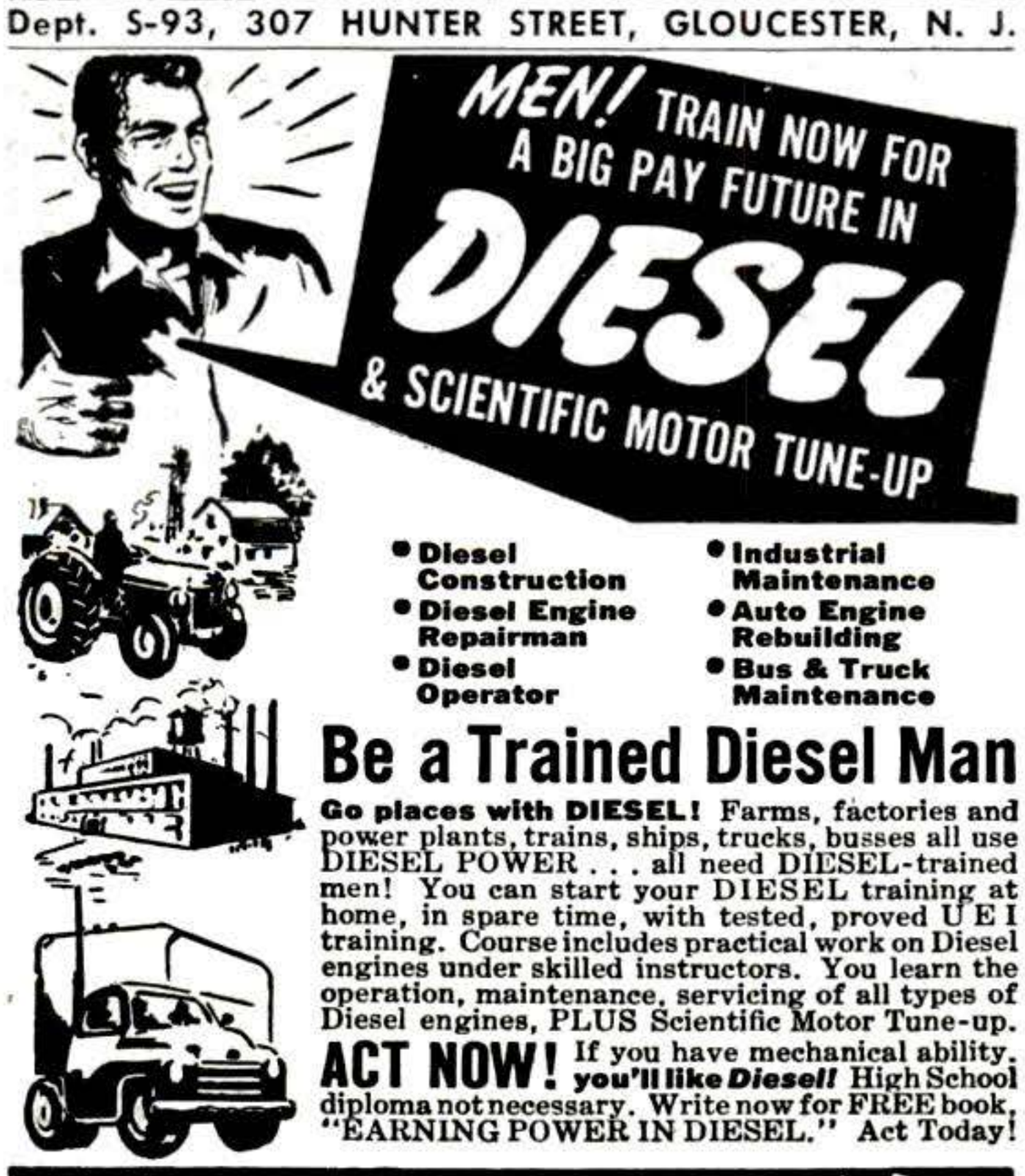

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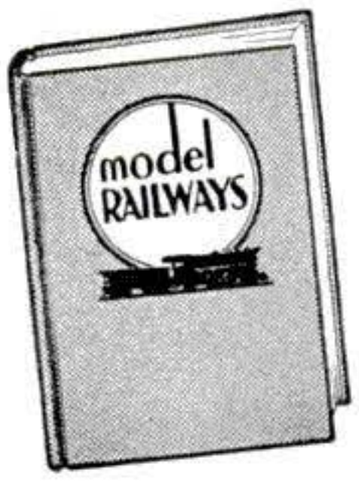

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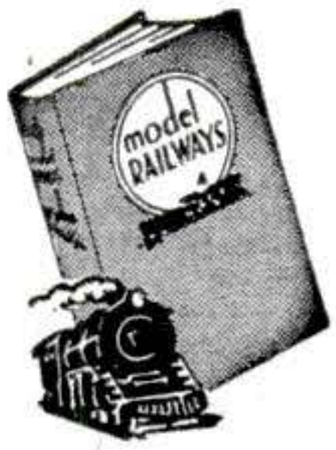

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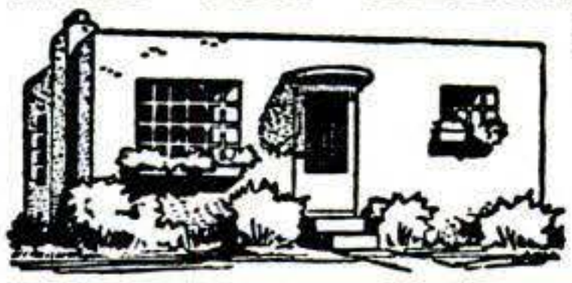

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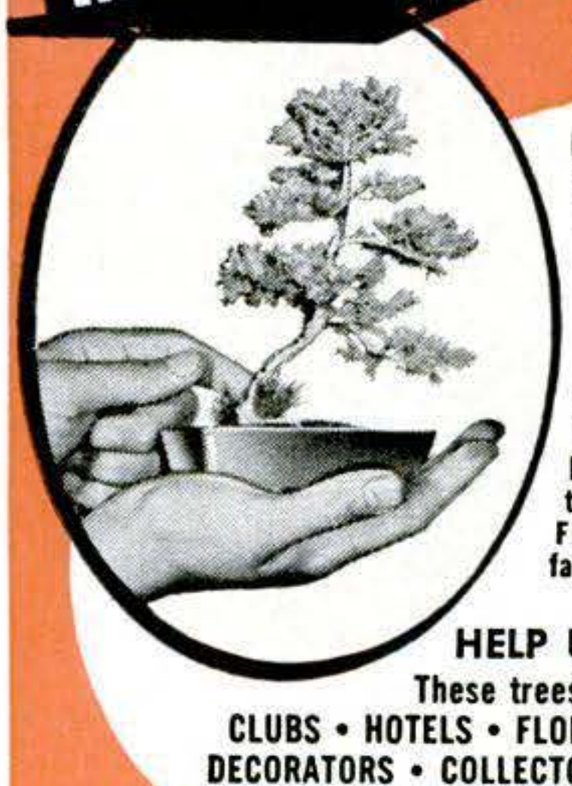

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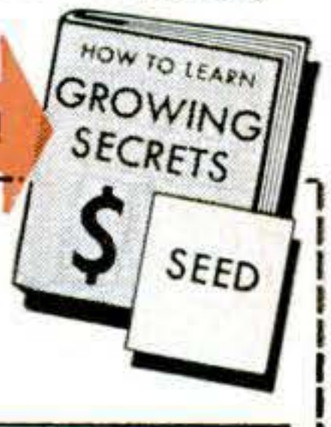

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SONGWRITERS! Protect your poems and songs! Don't mail anywhere! Write for safe procedure! Song Service, 333 W. 56th, Dept. P.S., New York 19, N.Y.

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$$$ IN Personalized Baby Record Books. Sell By Mail Use Same Literature We Do. No-Co-Ro, Oakland 6-P, Calif.

PLASTERCRAFT an interesting hobby or profitable home business $1.00. Haverty, 840 17th Street, Altoona, Pa.

WANT to retire? I did at 30—with one idea: Scientific Mailorder. Around one product I formed a countrywide marketing organization controlled by one set of reins from one room. System brings me thousand dollars monthly to any mail address! You apply system around another product. Details: Williamson, 2231 Lincoln, Altadena, California.

ALMOST a family tradition, our extraordinary home mailorder—a rare kind we created years ago—goes on giving us $12,000 a year (near 25 years!) practically unattended! No addressing; no mailing; surprisingly little expense! Ideal one-person, low-budget, steady-income system. Details free. The Homestead, 1674 Soniat, New Orleans 15, Louisiana.

ADDRESSERS Needed Immediately by national firm. Type or longhand. Everything furnished. Rush 3c stamp for information. Cosgrove, Box 4097-N, San Diego 4, California.

EARN big money mailing our merchandise catalogs. Sample catalog, details 25c. Products, 526 S. Western, Chicago 12, Ill.

HIGHLY Profitable Home Work—Doing Addressing, Mailing. Darnell, Box 586, Jackson, Tenn.

YOU can be Notary Public. Information Free. Magnolia Press, Box 1272-S, Burbank, Calif.

39 FORMULAS, PLANS, ETC.

FORMULAS—All kinds. Latest products. Literature free. Kemico, Park Ridge 15, Ill.

500 MONEY Making Formulas. 25c Postpaid. Allen, Dept. PSC, Clinton, Missouri.

LABORATORY Tested Formulas. Catalog free. Pont Chemical Company, Terre Haute 1, Indiana.

FREE Formula Catalog. Anything analyzed $35.00. Western Chemical, Salem, Ore.

LATEST and best in modern manufacturing formulas since 1897. Literature free! Lescomb Miller, Chemist, Tampa, Fla.

ANY Formula $3.00. Chemical Instruction Sheet—catalog 10c. J. Belfort, 216 W. Jackson Chicago 6.

40 PLASTICS

PLEXIGLAS, Lucite. Any size sheets masked Square foot (12 x 12) cost 1/16" $1.20; ⅛" $1.40; 3/16" $1.75; ¼" $2.08. Include 10% postage. Almac Plastics, 600 Broadway, N. Y. C.

PLASTICS home-craft course for Men and Women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for Free booklet. Interstate Training Service, Dept. D2-J, Portland 13, Oregon.

NEW liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for Castolite Creations Manual and proved Success Plan showing how to make money at home. Castolite, Dept. K-102, Woodstock, Ill.

PLASTIC Sheets, Rods, Tubes; etc. Free List. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

PLASTICS—Cements—Dyes—Findings—Carvings. Wholesale prices. 64 page catalog free. "Trace & Carve" pattern book for carving and coloring fish, birds, animals, only 35c. Taylor & Art, Inc., 1710 East 12th St., Oakland 6, California.

DIRECTORY of Manufacturers, for liquid plastics, liquid rubber, wholesale. Castleco, 2139S, Paterson, New Jersey.

PLASTICS—Lucite, Plexiglas, Acetate, Vinylite, Polyester-Fiberglas. Low, low prices. Value-packed, bargain-filled catalog—10c. Airmailed—25c. Gem-O'-Lite, Box 6865P, North Hollywood, California.

41 CHEMICALS & APPARATUS

NEW Idea Chemical and Apparatus Outfits for Home Experimenting Photo-Scales, Microscopes, Chemicals, Biological and Laboratory, Supplies in Small Quantities. Catalog 25c. Established 1931. John H. Winn, 124-B West 23rd Street, New York, N. Y.

LUMINOUS Paints will glow in dark. Six colors. Fairmount Chemical Co., 136 Liberty St., New York City 6.

SPECTROSCOPE for quick chemical analysis $3.00. Cutting Sons, Los Altos, California.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 10c. Tracey Laboratories, Evanston, Illinois.

COMPLETE Catalog. 15c. Surplus lists. Laboratory Sales, Box 161-B, Brighton, Mass.

CHEMICALS and apparatus for industrial, analytical, and private laboratories. Catalog 25c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

MERCURY, while it lasts, 25 cents per ounce—postage included. Nucleus Trading Co., 1558 Minford Place, New York City 60.

AMAZING New Book of Science, Experiments, Formulas and catalogue of Laboratory Supplies. Only 25c. National Scientific Co., Dept. 15, 2204 W. North Ave., Chicago 47, Illinois.

42 HELP WANTED

FOREIGN & Latin American Employment 1953 "Foreign Service Directory" gives Up-To-Minute Facts on Military & Civilian Construction, Government Jobs, Major Oil Listings, Aviation, Transportation, Steamship Lines, Mining, Importers, Exporters, How-When-Where to apply, application forms, Hot List Firms Hiring. $1.00 postpaid. Global Reports, Box 883-S, Hollywood 28, Calif.

ALASKA!! Last American Frontier. $1.00 brings 1953 Business Directory & Government Map, Military & Civilian Construction; Homestead & Highway facts; Mining, Aviation, Fur Farming, Grazing, Timber, Travel directions, List of firms hiring, How to apply. Alaska Opportunist, Box 92-S, Hollywood 28, Calif.

MONEY Back Guarantee! Universal Construction News! Worthwhile magazine of job openings. $1. Universal, U-1, Box 30, Billings, Montana.

GIANT overseas job list: How, When, Where leads. New lists weekly. $1.00 postpaid. Universal Publishers, Box 2446-A, San Francisco 26, California.

$1,000,000 FOREIGN & Domestic Construction Projects published Monthly, gives Contractor & Locale, How-When-Where to apply with application form, $1.00 postpaid. Global Reports, Box 883-PX, Hollywood 28, Calif.

FOREIGN Employment Construction Work. If interested in foreign projects with high pay, write Foreign Service Bureau, Dept. PS, Metuchen, New Jersey.

LADIES: Address Folder Cards Spare Time! $40 Weekly possible! Enclose stamped addressed envelope; write Folders, Tillar, Arkansas.

ADDRESS postcards at home. Make $50 week. Lindo, Watertown, Mass.

CALIFORNIA—Men needed now. Unlimited openings. Jobs for everyone. Skilled—unskilled. Highest wages. Send $1.00; California Job Opportunities, Box 870-J, Los Angeles 53, California.

$1300.00 MONTHLY for truck drivers, $1400.00 monthly for carpenters, electricians, plumbers, mechanics, $1200.00 for clerks and laborers, over $2000.00 for superintendents. Limited hiring now being done. Full information and complete foreign listings, with current information on Spain job, $1.00. Women's listings, $1.00. Complete information on stateside projects, opportunities, living conditions, etc., and domestic listing $1.00. Specify listing. Dept. 4-I, Opportunties Unlimited, 1110 Commerce Bldg., St. Paul, Minnesota.

SAN Francisco complete Sunday classified section Air-Mailed $1.00. Jobs, Rentals, Businesses etc. Letters remailed 25c. Five free with each ad order. Burkett, 730 Eddy, San Francisco.

CONFIDENTIAL reports on highest paying jobs in the United States and 28 friendly foreign countries, including Alaska, South America, Europe and Middle East. All types of jobs for skilled and unskilled, supervisory, clerical, laborers, all trades and many others. Fee ony $2, including one year registration and advisory service. We can help you. The only service that guarantees complete satisfaction or your money back. National Services, Box 2954, St. Louis 17, Missouri.

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EMPLOYMENT SERVICES

FOREIGN Jobs. Contracts underway and soon starting in Africa, South America, Canada, England, Europe, South Pacific, Middle East, Mexico and Alaska. Send $1.00 for foreign job news, information, application forms, etc. DCS Foreign Job News, Dept. 268-NR, Bridgeport, Ill.

OVERSEAS Jobs. Big pay, transportation expenses. Clerical, professional, mechanical workers. Most all trades. Latest listings, airline, construction, manufacturing, oil, steamship companies, government agencies, many other opportunities. Up to date information on securing employment, contracts, income tax, application forms. $1.00. Overseas Jobs, Box 335-B13, Baton Rouge, La.

CONSTRUCTION Job List. Published Monthly. $1.00. Dempster's Construction Scout News, Dept. 268-NQ, Bridgeport, Ill.

43 AGENTS WANTED

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity 28 E. Jackson, Dept. 18, Chicago 4, Illinois.

AGENTS—300% profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-E North Clark, Chicago.

WHERE To Buy 800,000 articles direct from manufacturers at wholesale prices. Send name, address for free outline. Glass Publishing Company, Ellwood City 8, Pa.

ABSOLUTELY Free—Sales Kit. Yours for the asking. Send postcard today requesting kit showing new line, belt buckles with your name or personal initials, cap badges, choice 3000 different emblems. Write Hook-Fast, Box 1425PS, Providence, R. I.

GOLD, Silver lacquered letters. Windows, doors, trucks. Standard sizes. Penny and up. Big profits. Samples. Atlas-E, 544 West 79th, Chicago 20.

AT Last! Something New and Sensational in Christmas Cards. Make Extra Money Fast! Show Satins, Velours, Metallics. Gets Easy Orders. Pays up to 100% Cash Profit. 30 Free Samples. With Name 50 for $1.50. Big Line. Amazing new Glo-In-The-Dark Ornaments, Personalized Matches, Stationery. Several $1.00 Boxes on Approval. Puro Greetings, 2801 Locust, Dept. 341-L, St. Louis, Mo.

BIG profits selling ties ($2.00 values) $6.50 dozen. Free catalog. Empire Cravats, 611 Broadway, New York 12.

MONEY For Xmas. Make at least $50 showing beautiful Elmira Christmas and All-Occasion Greeting Card Assortments—Name Imprinted Christmas Cards, Stationery, Napkins, Book Matches, Playing Cards—Gift Wraps, Books, Games, Household, Hostess Items. All unbeatable values. Make money while you make friends. No Experience Necessary—No Risk—Send No Money. Free Samples, Catalog, Bonus Plan, Display Assortments on Approval. Write Today! Elmira Greeting Card Co., Dept. C-178, Elmira, N. Y.

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START Your Own Business on credit. Your own boss 1658 of our Dealers sold $5,000 to $27,500 in 1952. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant, profitable business backed by world-wide industry. Write Rawleighs, Dept. I-U-PSC, Freeport, Ill.

1954—WHOLESALE Dealer Kit on appliances, typewriters, recorders, cameras, giftware, lighting fixtures Free. Write Arrow Distributing, 154J, Nassau St., NYC.

SALESMEN—make up to $50 in a day selling brand new item going to every type of food and beverage store, factories, laboratories, hospitals, etc. Samples Furnished. Utility Durawear, 53 West Jackson Blvd., Dept. PS-9, Chicago 4, Illinois.

DROP everything! Sensational earnings now to Christmas with fastest-Selling, popular-priced personal Christmas Cards, name-imprinted. Also album of deluxe designs. Box assortments, too. Send name for samples. Wallace Brown, 225 Fifth Ave., Dept. G-4, New York 10, N. Y.

TELE-PEP (TV) Unit. On Mexican stations—$2.95. Sensation. Smith Agency-PSV, Excelsior Springs, Mo.

JUST Out! New Thrilling Sensation in Christmas Cards. Make Big Money! Show Lustre Foils, Satins, Brilliants. Amazing Values bring Easy Orders! Magic Glo-In-The-Dark Ornaments, Personalized Stationery, Matches. 30 Free Samples. With Name 50 for $1.50. Several $1.00 Boxes on Approval. Joy Greeting, 507 N. Cardinal, Dept. 61-M, St. Louis, Mo.

$200 WEEKLY. New invention. Amazing 4-second Presto Emergency tire chains, fit all modern auto wheels. National advertising building big demand. 3 sales daily to oil stations, dealers, etc., make $200 or more weekly. Territory going fast. Write Presto Chain Co., Dept. P-25, Des Moines 2, Iowa.

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MAKE Money with fast-selling Bostonian Shirts. Blouses too. Spare time, full time. Sales Kit Free. Bostonian, 89 Bickford, Dept. A-11, Boston 30, Mass.

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AMAZING Quick Easy Cash Yours! No selling, show Rainbow's beautiful Christmas Card assortments, gifts, personalized stationery, napkins, etc. Save friends, relatives time and money. No investment. Deal with one of New York's largest imprint companies for guaranteed satisfaction. Costs nothing to try. Write today. Samples on approval. Rainbow, Dep't D, 38 E. 1st St., New York 3, N. Y.

AMAZING Money Making Offer—$50 or more selling 100 boxes America's Leading Christmas Cards. Samples On Approval. Complete Line. Free Samples Personal Christmas Cards and Stationery. Sensational Bonus. Write. Lorain Art Studios, Dept. 114, Vermilion, Ohio.

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BUY Wholesale thousands nationally advertised products at big discounts. Free "Wholesale Plan." American Buyers, 629-T Linden, Buffalo, New York.

SENSATIONAL Bargains—Profits! Suits $1.75, Pants 35c, Dresses 20c, Shoes 20c. Operate from store, home, car. Free catalog. Superior, 1250-B Jefferson, Chicago 7.

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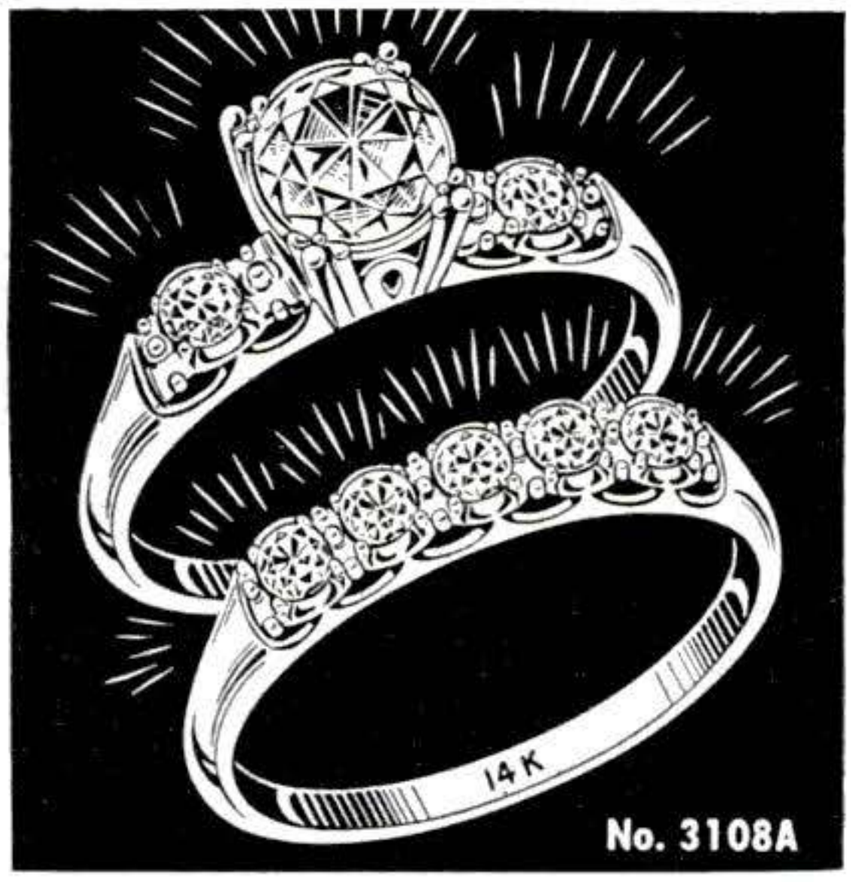

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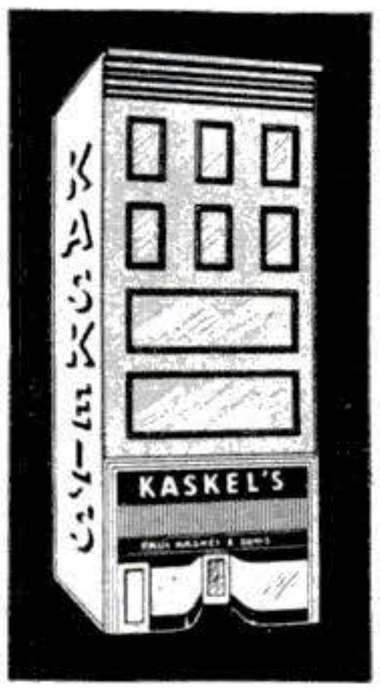

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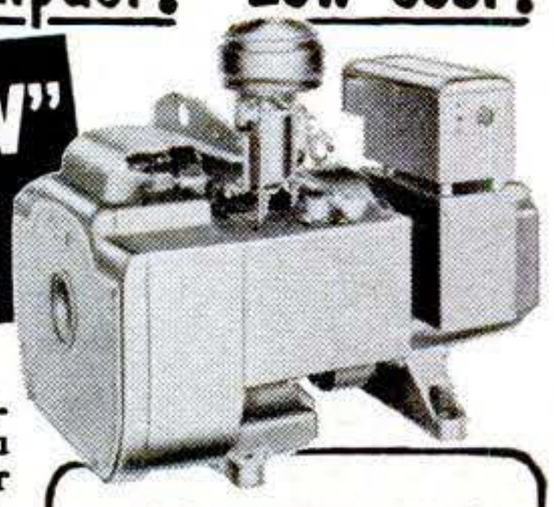

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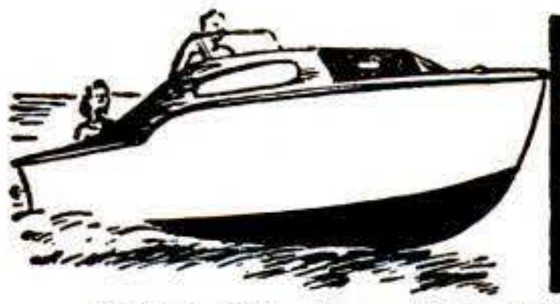

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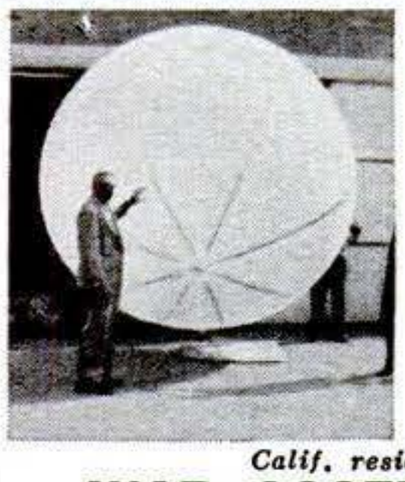

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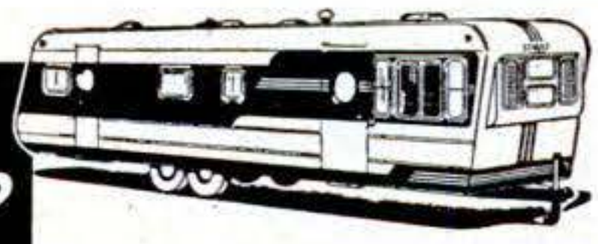

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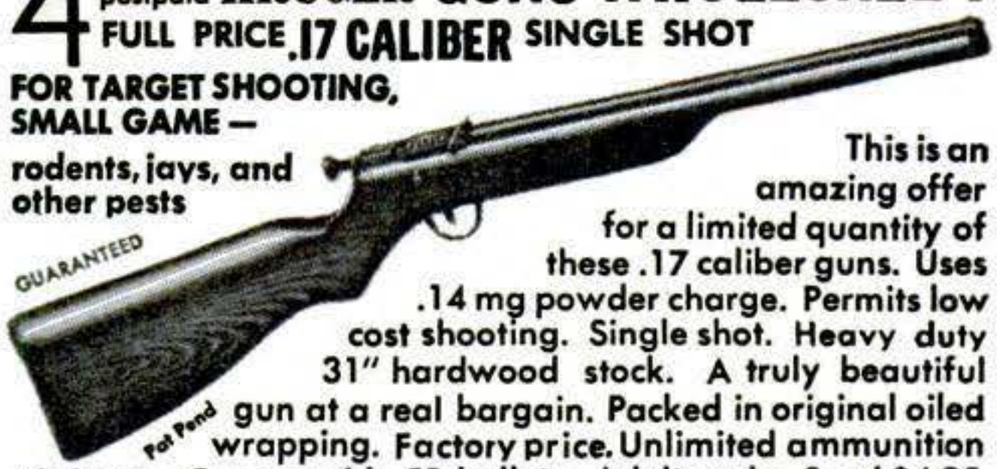

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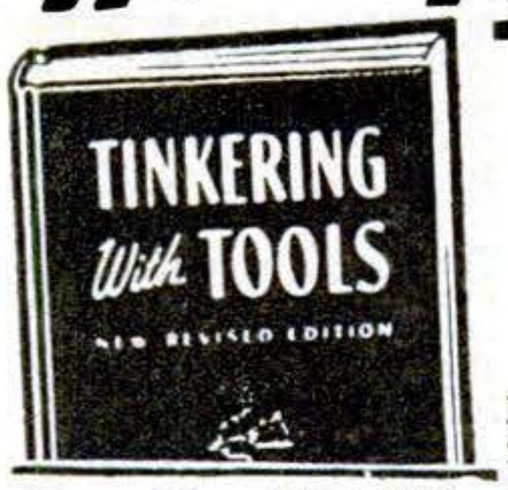

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American made Wollensak telescope. Instant focusing at 15x, 20x, 30 and 40x, etc. Turn power tube to click — no guesswork. Telescope measures 9" closed, 27" when extended. Weighs only 18 oz.! Has rust proof chrome tubes, large 40mm objective lens. All 12 optic surfaces are COATED. See .22 bullet holes clearly at 300 ft. Use for astronomical observation. $33.50 price **includes** fine leather case. No Fed. tax!

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The season's best boat kit buy! Pre-assembled frames, all parts cut to size and shape for speedy assembly. Write today for FREE brochure.

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QUIET TWO-WHEEL

ROCKET SKATES

All the thrills of ice skating but no ice needed. Rocket Skates glide quietly by—on sidewalks or floors—on special plastic-rubber wheels that absorb both shock and noise. Harmless to floors. Two-wheels balance as easily as a "bike." Rocket Skates allow more speed, faster pivots and stops. Safer, too, as rounded wheels have no sharp edges to cut in case of spills. Shaped, foam rubber pads across ankles prevent chafing. Double ball bearings on each wheel, sealed against dust. Specify shoe size when ordering. Only $6.95 postpaid. No COD's, please. Money back if not delighted. Rocket Skate Company, 1121-37 Chestnut Street, Burbank 9, California.

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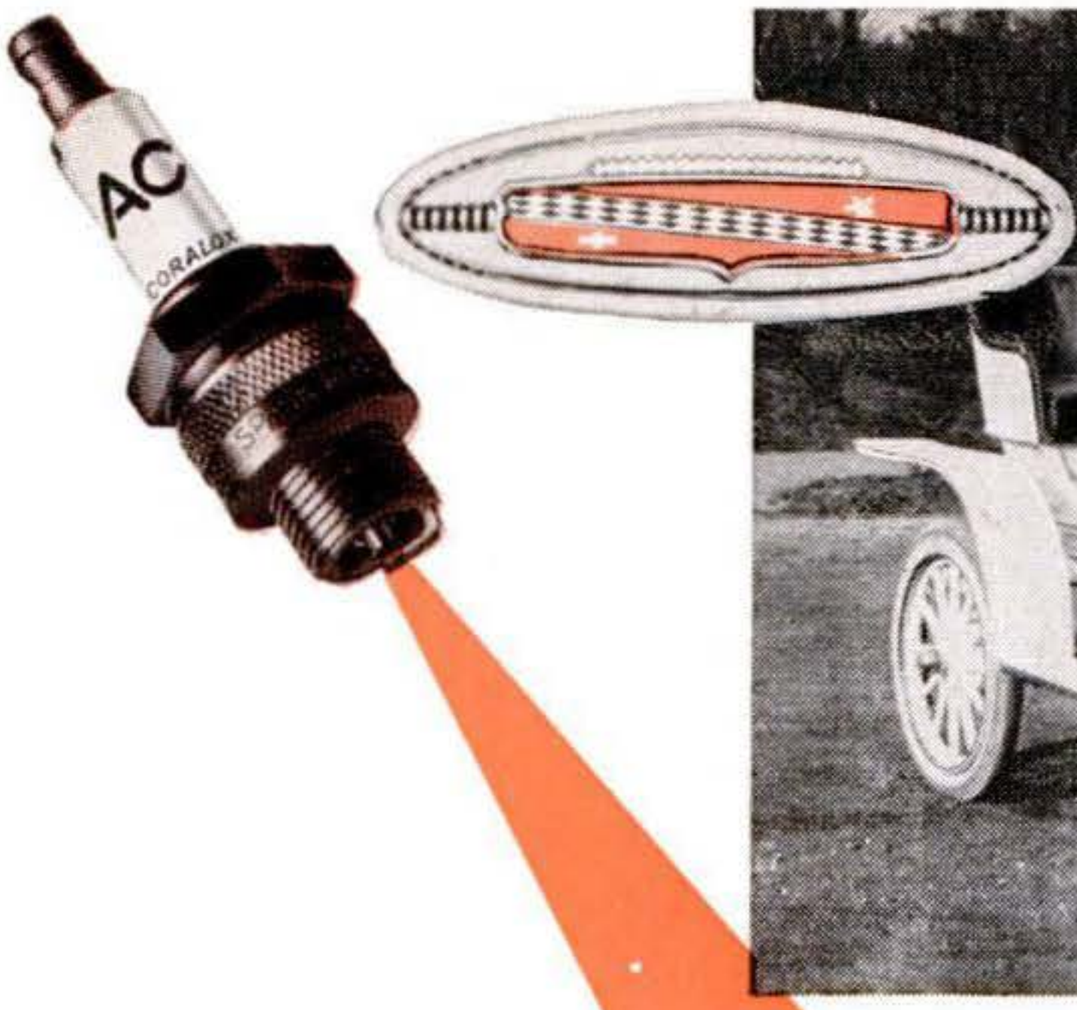
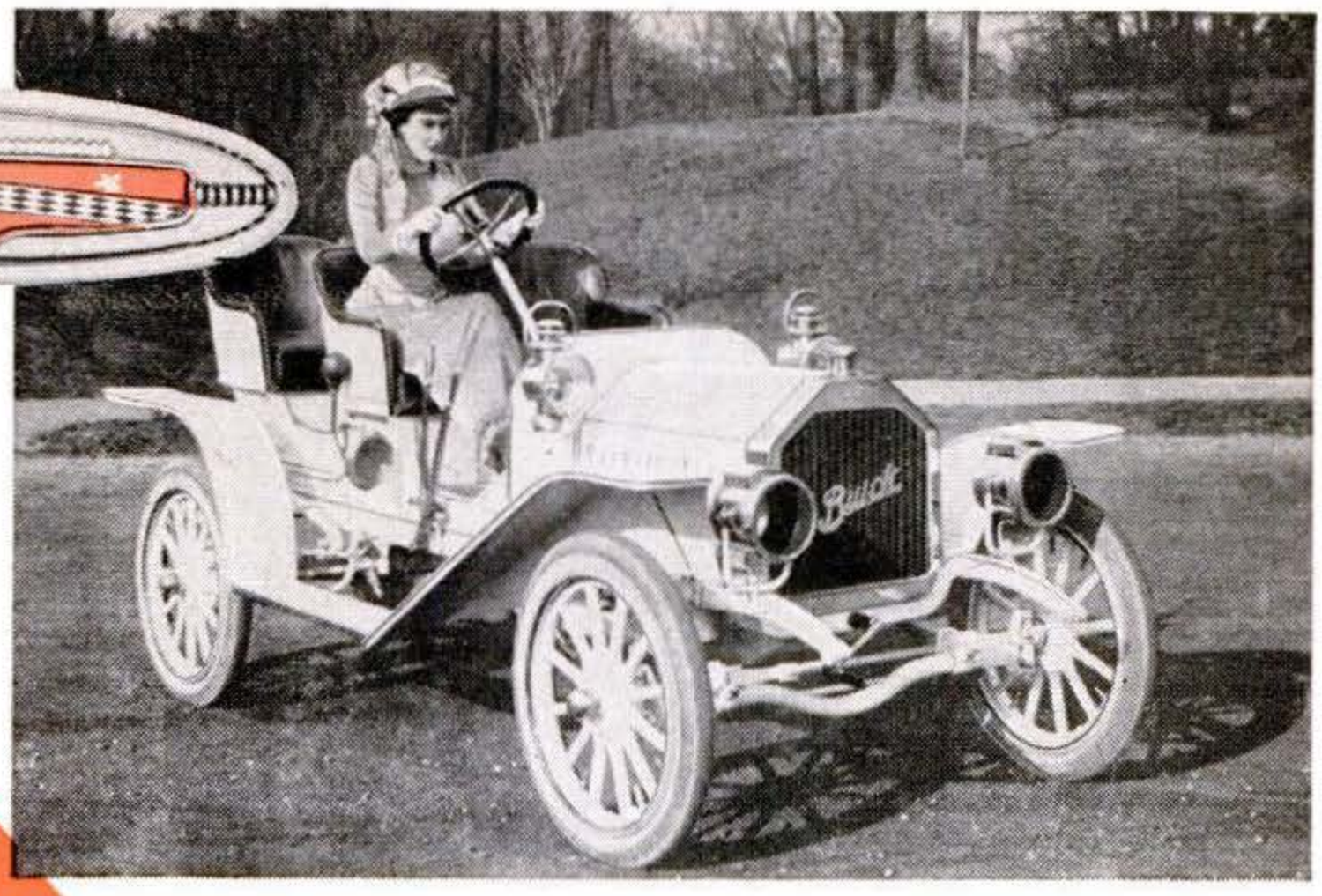




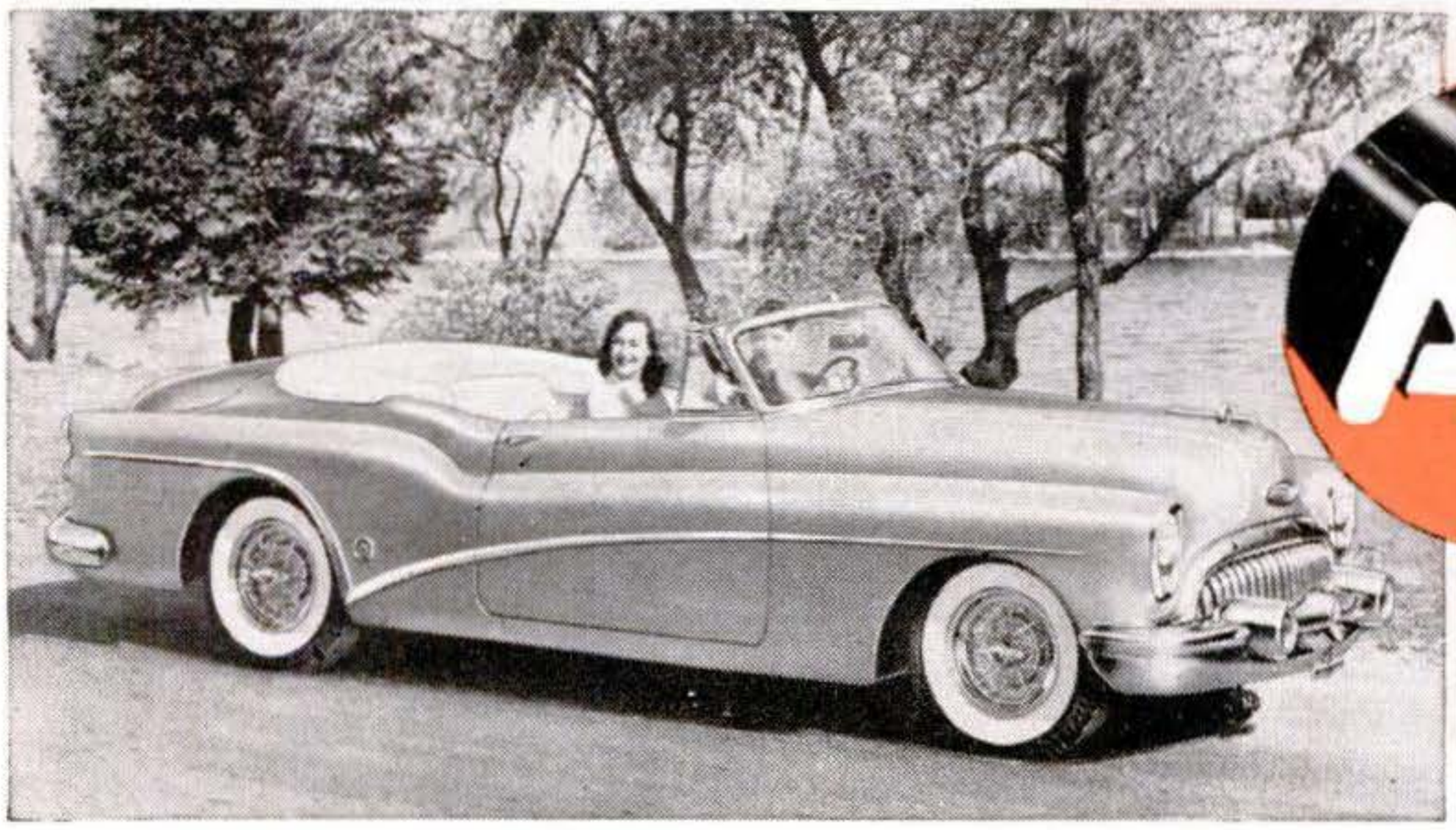
This little number was the height of fashion in 1908—the popular and sporty Buick, Model 10 Roadster.

On every BUICK for 45 years

Buick was the very first car to be equipped with AC Spark Plugs—'way back in 1908. And, today—millions of Buicks later—AC is still factory equipment on all new Buicks being built.

Such acceptance is no accident. Buick engineers know that ACs deliver top performance in high-compression, high efficiency engines like the Fireball V-8. They know, too, that AC's patented *CORALOX* Insulator is today's greatest contribution to spark plug efficiency—insuring smoother firing, longer life and greater gas economy.

Regardless of what make of car you drive—treat it to a new set of ACs—discover what Buick drivers already know about AC's superior performance.



"Pick-up power" or "passing power"—whichever you want, Buick's 1953 Skylark is a standout for sparkling performance.

PATENTED CORALOX INSULATOR

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Original Equipment on Nearly as Many New Cars as All Other Makes Combined

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Exciting new 1953 Studebaker receives Fashion Academy Award!

Gold medal for outstanding design and distinctive styling presented to the new American car with the European look

AMERICA'S most strikingly original car now proudly carries a new distinction.

The Fashion Academy, noted New York school of fashion design, has presented its Gold Medal for outstanding style to Studebaker.

Arrange to drive this excitingly different new Studebaker—this dramatically low, superbly balanced new car that officially proved itself a top gas mileage star in this year's Mobilgas Economy Run.

Find out what a brilliant performer the 1953 Studebaker is—what road-hugging stability it has. Nine body styles to choose from—and all down to earth in price. Stop in at a Studebaker dealer's.

Commander V-8 Regal Starlight coupe for five. Chrome wheel discs, white sidewalls—and glare-reducing tinted glass—optional at extra cost.

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Denver Pedestrians Jaywalk Because

Their 'Barnes Dance' Cuts Traffic Toll

When cars stop, folks in the mile-high city head in every direction to cross streets as noted traffic engineer taught them.

By Wesley S. Griswold

SHORTLY after dawn, the driver of a Denver airport bus braked to a stop at a red light hung over the middle of a shady block and grunted. There was no intersecting street there.

"We are now waiting for the ants to cross," he said sarcastically to his passengers. "This is some more of Henry's work."

"Henry," sometimes called "Hustling Hank," is a man named Barnes. Every driver in Denver knows about him. They have jawed and jeered at him, admired and praised him, while he went about rescuing them from the awful mess they were in six years ago. "Creeping chaos," he called it.

Now that the fuss has died down, Denver, with nearly twice as many cars as it had when Henry Barnes arrived to be its traffic engineer in 1947, is twice as safe a place to run around in as it

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NEVER OUT OF TOUCH with Denver's traffic problems for an instant, Barnes had police radio, phone and dictaphone in his official car. He dictated memos as he went his rounds.

"SCOUT BARNES AT YOUR SERVICE, MADAM" was the title of this cartoon by Paul Conrad which the *Denver Post* ran when it announced that Barnes was leaving for Baltimore.

was then. The death rate in auto accidents has been cut by more than half. Thirty minutes have been shaved off the nightly rush hour. Pedestrians, who used to lose around seven of their number every year crossing the downtown streets, have learned to do a "Barnes dance" that has kept them all alive.

Barnes has taught Denver folks to believe in signs—thousands of them. He created one-way streets by the dozen, lengthened "through" streets by scores of miles, and planted a forest of parking meters. He erected hundreds of new signal lights, got the police to crack down savagely on double-parkers, and limited parking to one side of one-way streets.

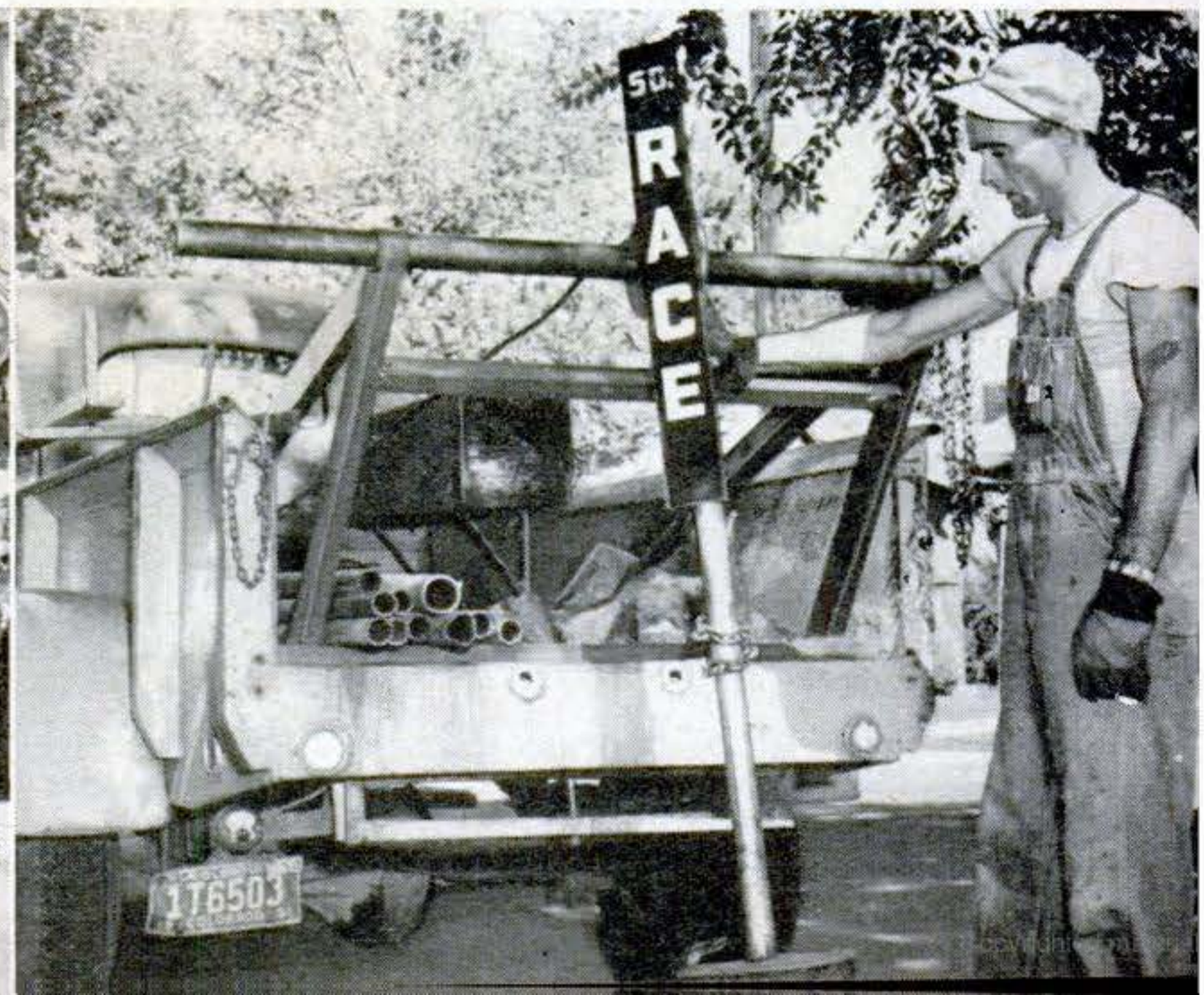
He prevented passenger cars from parking anywhere in the shopping district for two and a half hours early each workday morning while trucks loaded and unloaded. The trucks stayed out of the way the rest of the day.

He showed pedestrians an exciting new way to cross a street and invented an electronic brain to direct traffic with maximum efficiency at 120 of the city's busiest intersections.

While this was going on, Barnes, who 15 years ago didn't know what a traffic engineer was, was becoming the best-known—and best-paid—traffic engineer in the U. S. Baltimore has hired him away from Denver at $18,000 a year to per-

NO JAYWALKER, the young man below started out on a "Walk" signal. It now reads "Don't Walk," but that's to halt the people at the curb. He still has time to get across.

"JUST LIKE CHINESE SCRIPT" were Denver's old vertical street signs. Many drivers had collisions trying to read them. Barnes uprooted them all, put in 20,000 taller, horizontal ones.



form his surgery on its clogged arteries.

Denver, a little less than half as big as Baltimore, was spending only $6,800 a year on its grievous traffic ailments when Barnes was called from Flint, Mich., to take over. In the nearly six years since then, Barnes' prescriptions have cost Denver more than $3,000,000 and many a twinge. But, urged on by the mayor and city council, and coaxed by the newspapers, the patient has taken the medicine with only a reasonable amount of grousing.

"Being a sort of an ignorant fellow," says Barnes, who educated himself with 20 years of night-school classes and correspondence courses, "I often did things nobody had tried before. That always arouses suspicion. But the things made sense to me, and they usually worked out all right."

Instead of putting the law on Denver's jaywalkers, for instance, Barnes encouraged everybody to imitate them. At the neon signal "Walk," pedestrians at 53 downtown intersections can cross the streets any way they like. Many of them chose to head across the intersection diagonally. Meanwhile, though, all automobile traffic is halted.

"If you don't avoid mixing cars and people on foot," Barnes says, "you're bound to get succotash."

When the crisscrossing streams of people on foot have completed their "Barnes dance," first one line of waiting cars and then the other is given a green light. Pedestrians, now stopped by "Don't Walk" signs at every corner of the intersection, are kept entirely out of the way.

This arrangement not only put an abrupt end to pedestrian deaths at downtown intersections, it also enabled as many as 15 cars to turn a corner in the time it had taken one to do so before.

It took a little while to get the hang of the "Barnes dance," but 80 percent of the people of Denver now think it's fine, according to the local *Post*.

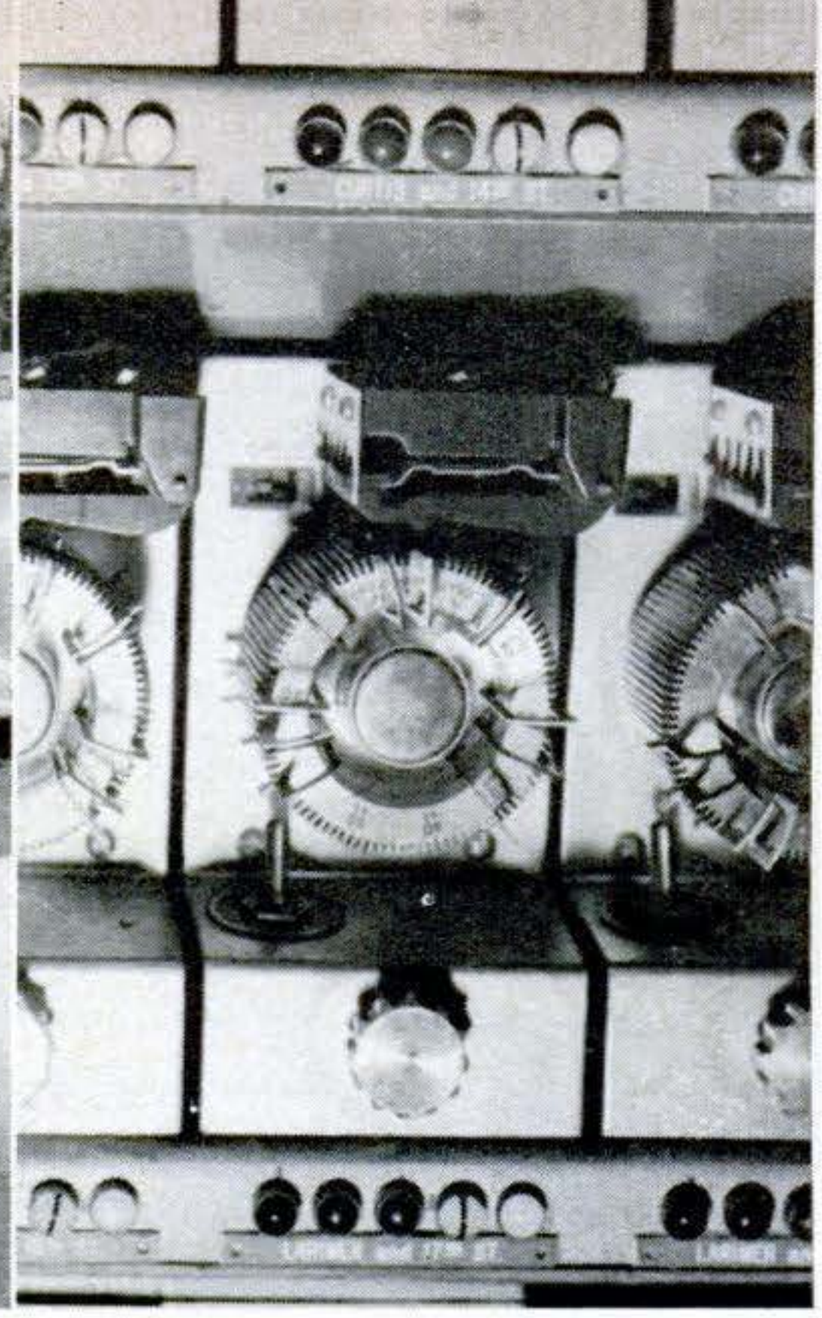
The idea for "Barnes' second brain," as his electronic traffic-control system is often called, was first put on paper in a New York hotel dining room one evening about four years ago. Barnes sketched it out on scratch pads and the tablecloth for a couple of electronics engineers. It then took two years to design, build and install the "brain," at a cost of $115,000.

Lights Are Adjusted by Remote Control

Described as simply as possible, it is a means of constantly sampling the traffic that is entering, leaving or milling around in downtown Denver and, by remote control, automatically adjusting the signal lights at 120 intersections to move the traffic steadily whether it is heavy or light.

Rubber treadles—technically called

"HENRY'S TANK TRAPS," as people jokingly called them, indicated where future isles of concrete would channel traffic and provide pedestrian refuges at this broad junction of Denver streets. It had neither signal lights nor safety zones when Barnes went to work to make it safe. His "traps" were constructed of yellow five-gallon cans, filled with sand.



TRAFFIC FEELERS — pressure-sensitive vehicle detectors set in Denver pavements—send electrical impulses to a central electronic brain in the city hall. The brain notes traffic volume and automatically slows down or speeds up rows of dial units (right) that regulate the signal lights at 120 downtown intersections. Henry Barnes originated this system.

"pressure-sensitive vehicle detectors"—set in the pavement at six crucial places, sample the traffic flow as cars pass over them. The treadles flash impulses to a quiet basement room in Denver's handsome city hall. Here there is a train of metal cabinets, looking very much like an electronic computer. Impulses from the treadles enter one of these cabinets and accumulate there briefly. Every six minutes, they are "counted" automatically.

If more of them arrived in the last six minutes than in the previous six, traffic in certain parts of town is obviously picking up.

Electronic selectors note this fact and instantly arrange to keep the green lights on for longer intervals along the routes that the increased traffic is traveling.

Less Traffic—Faster Lights

If fewer treadle impulses arrived in the last six minutes than in the six minutes previous, the selectors speed up the rate of change of the signal lights, so that the fewer cars moving on those routes won't be held up unreasonably long at the intersections.

A master selector analyzes what is going on at all sampling points—for traffic naturally isn't simultaneously heavier or lighter everywhere—and arranges the behavior of the signal lights to accommodate more cars here, fewer there.

Henry Barnes, at 46, is a graying man, still somewhat gaunt from a critical illness last spring. At the time of his departure from Denver, however, he still deserved the nickname "Hustling Hank." The energy and enthusiasm that had kept him probing at Denver's traffic problems 60 hours a week for five and a half years, ignoring vacations for the first four, hadn't diminished a bit.

Up till the end of his stay in the Colorado capital, he still restlessly drove about its streets whenever he could do so, hunting for bottlenecks in the making. His special car was equipped with dictaphone, telephone and police radio, and his 80-man staff frequently was made aware of the fact that he was on the job even when he was out of their sight.

One ear still gives him trouble as a result of its being frozen one winter morning when he discovered a stuck signal light on the way to the office. Barnes spotted the faulty light, noted the cars it was starting to block up, sent out a radio call for a repairman, then got out

[*Continued on page 258*]

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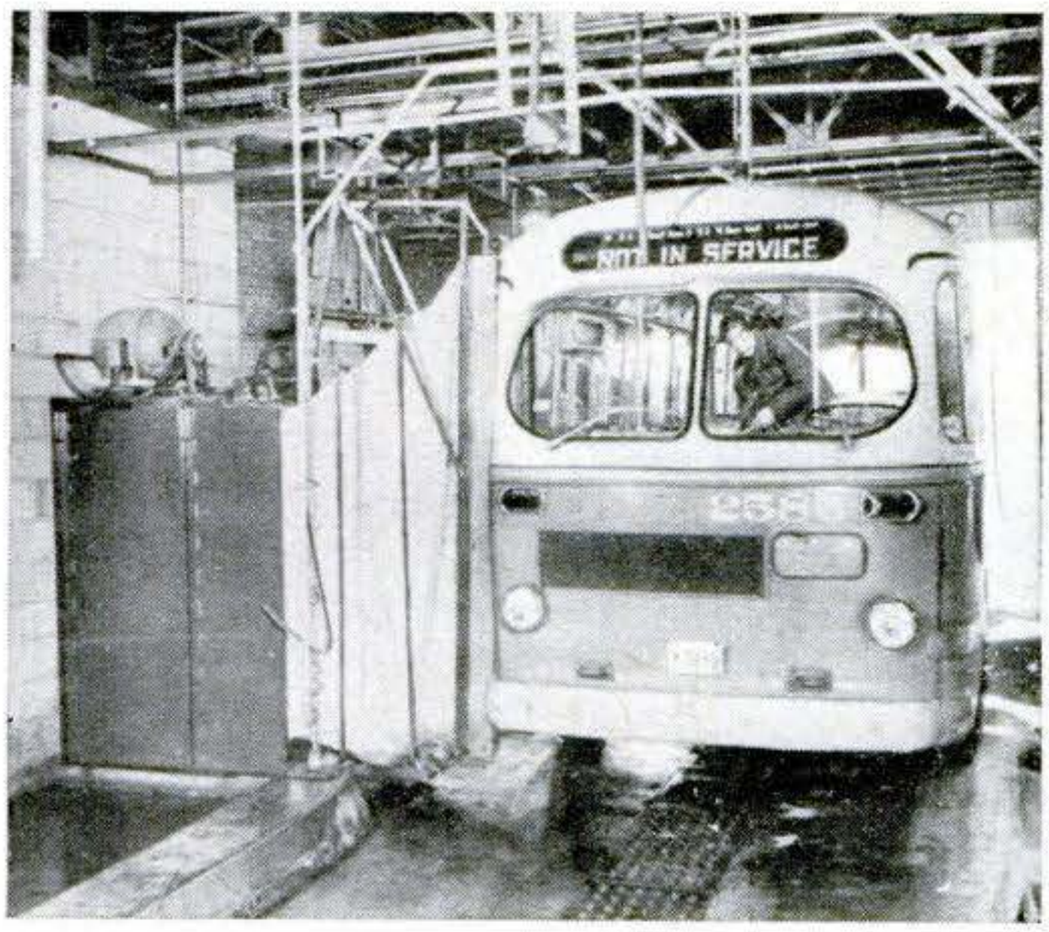
Bantam "Bat" Gun Can Knock Out Heavyweight Tanks

A MODERN version of David's slingshot, this new "Bat" gun is claimed by the British to be able to "slay" the biggest of war's Goliaths—tanks—that it is ever likely to meet in battle.

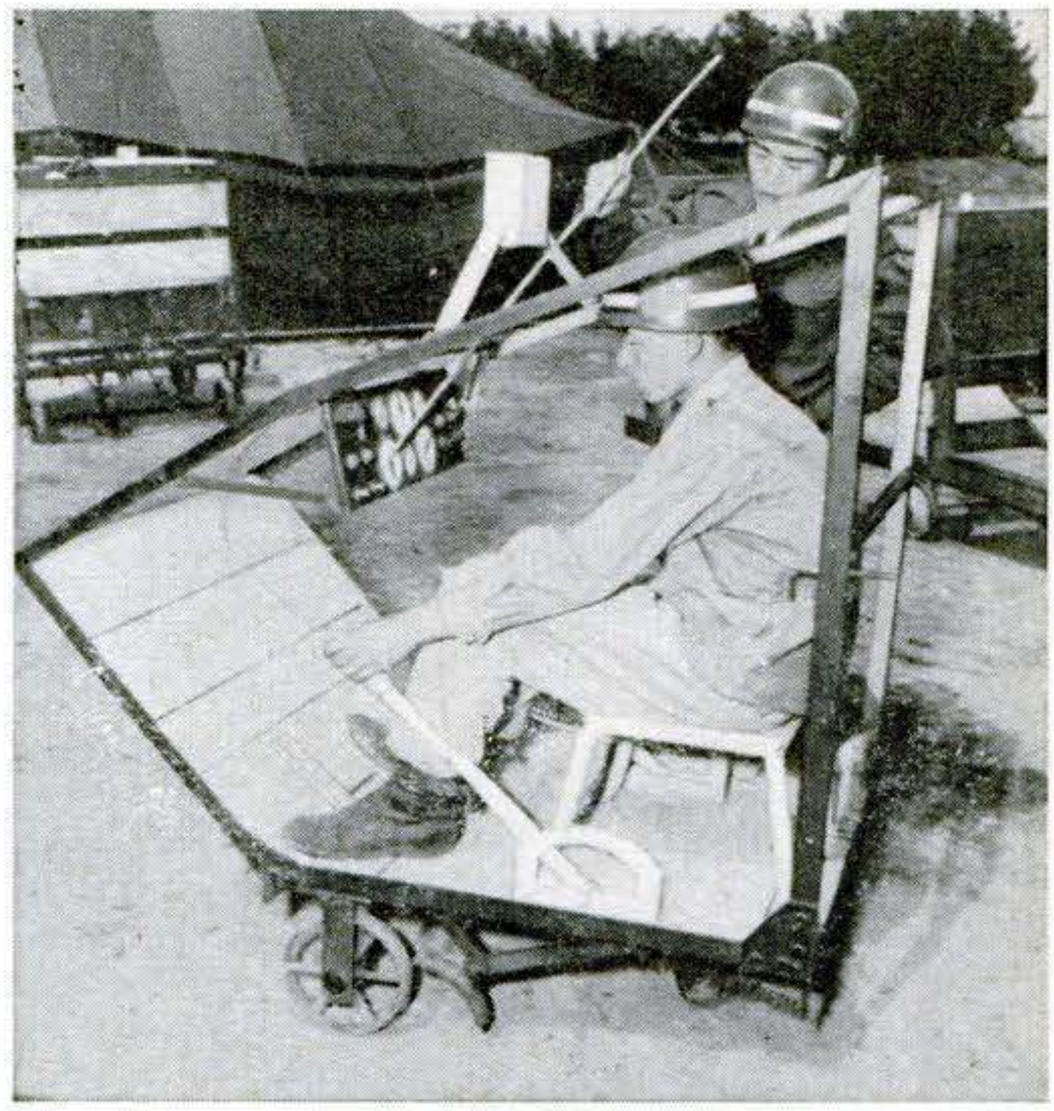
The recently demonstrated tank-killer is a 120-mm. weapon. It weighs only one ton as compared with the three tons of the 80-mm. gun British infantry battalions have been using against tanks. The Bat's killer punch lies not only in its large caliber but also in the power of its shell, the secret of which has not been revealed.

The new anti-tank weapon is non-recoiling because its movement when fired is balanced by a backward escape of gases through a vent. The gun can be towed by a jeep or carried in a light tank.



Giant Cleaner Sucks Out Bus

A CHICAGO company cleans out 110 buses every 24 hours with a king-size vacuum cleaner that attaches to the front door and inhales all the debris in each vehicle. Two 28-inch vacuum fans create air pressure behind a huge bellows that does the job. A man helps remove stubborn particles with an air hose.



Japanese Drive Dummy Tanks

FLEDGLING tank drivers in Japan's security police force learn the ropes in the weird contraption above. Instruments, brake levers and periscope are copies of those in a U. S. Army M-24 tank.

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Biggest Statue Re-creates Stirring Scene of World War II

LARGEST of its kind, a 110-foot-high memorial statue is nearing completion for Washington, D. C. The 100-ton bronze work of art will depict the historic raising of the Stars and Stripes atop Iwo Jima, by five Marines and a sailor, during the fierce battle that wrested the strategic volcanic isle from Japan in 1945.

Pictured above is part of the full-size plaster original with its sculptor, Felix de Weldon. The gigantic figures are faithful liknesses of the heroic flag-raisers—Sgt. Michael Strank, Corp. Harlon H. Block, Pfcs. Franklin R. Sousley, Rene A. Gagnon, and Ira H. Hayes, and Navy Pharmacist's Mate 2nd Class John H. Bradley.

Rapid Reading Is Taught by "Pacer"

IN SCHOOLS, homes and offices, the Shadowscope (left) trains a user to read more rapidly. A strip of illumination, covering a few lines of text, descends a printed page at adjustable speed. Setting this just a little faster than his usual reading rate, and using the device as a reading lamp, an individual learns to step up his pace. The trainer is made by Lafayette Instrument Co., Lafayette, Ind.

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Real Flying Saucer Designed for 1,500 M. P. H.

A FLYING saucer—the real McCoy this time—is being tested in Canada.

It is designed to carry a pilot—not an organism from outer space, but a genuine human being. The people in charge of the project figure that it will go 1,500 miles an hour. It will take off straight up and land straight down. The power plant is revolutionary. The pilot sits in a little island in the center of the saucer with the engine around him.

That much is fact. Everything else about this new flying machine, being tried out in model form at the A. V. Roe factory in Malton, Ont., is pure speculation. An artist's conception of what the thing *may* be is shown here. There may be one or more ram-jet engines spewing propulsive gases through nozzles at the saucer's sides. Vaned tail vents provide directional control. For take-off and landings the nozzles are pointed down for upward thrust.

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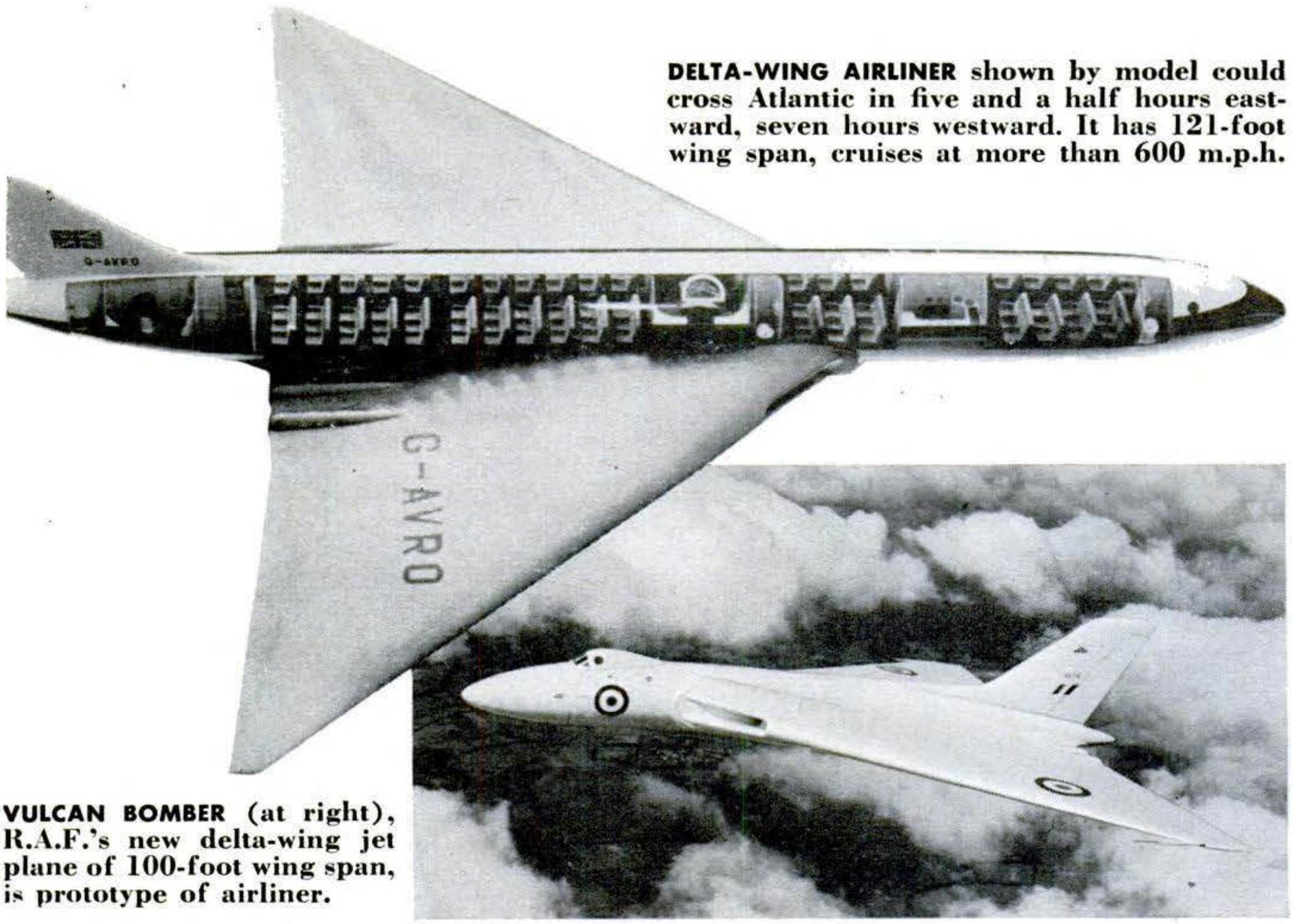


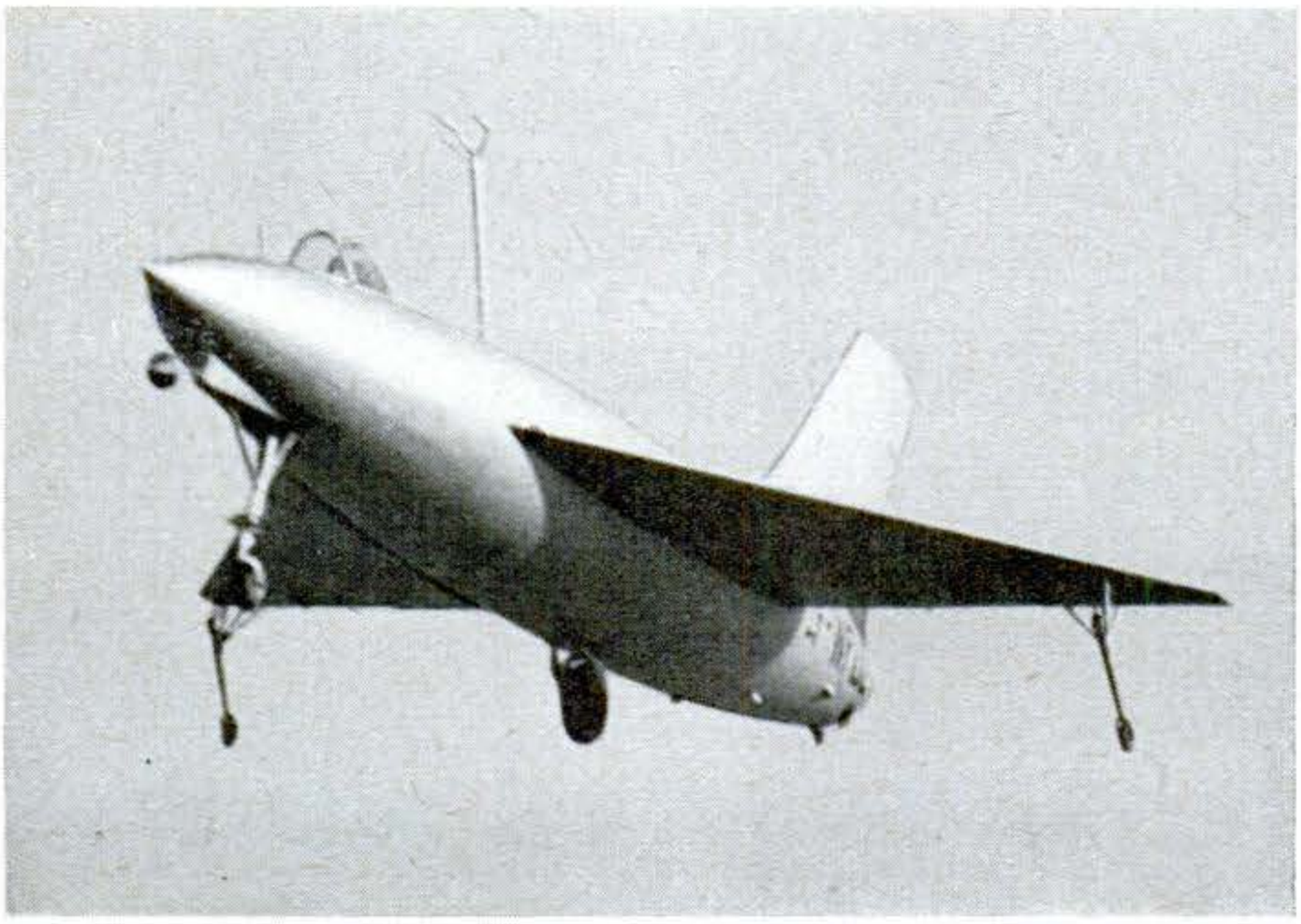
DELTA-WING AIRLINER shown by model could cross Atlantic in five and a half hours eastward, seven hours westward. It has 121-foot wing span, cruises at more than 600 m.p.h.

VULCAN BOMBER (at right), R.A.F.'s new delta-wing jet plane of 100-foot wing span, is prototype of airliner.

Triangle-Winged Jet Airliner Designed for Ocean Flights

CALLED the Avro Atlantic, the huge jet airliner pictured above could fly from New York to London in five and a half hours. The projected craft is sponsored by a leading British plane maker, A. V. Roe & Co., Ltd., and informed sources predict that it will be built. A larger counterpart of the Vulcan jet bomber, designed by the same firm, it likewise has wings of "delta" or triangle shape, which have favorable characteristics when the speed of aircraft approaches that of sound. Interior design may be varied to accommodate 80 to 130 passengers.

The craft would fly at 40,000 to 45,000 feet, climbing steadily as fuel consumption reduced weight. Then, cutting off power 200 miles from its destination, it would descend in a high-speed glide. Because of a jet plane's mechanical simplicity and the short time required for the ocean hop, a flight crew of only three would suffice.



French Glider Tests Delta-Wing Design

DELTA-WING aircraft, already introduced in Britain (see top of page) and the U. S., are now under development in France.

First French design to fly, the one-man glider at left has a 47-foot wing span. In trials, a four-engine Languedoc has towed the 2,800-pound craft at an altitude of 25,000 feet and unofficially reported speeds as high as 400 to 500 m.p.h.

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Talkative Terrier Speaks 20 Words

HOLLYWOOD's latest find is a dog who can out-talk eighteen-month-old babies. Named Mr. Lucky, the seven-year-old Boston terrier not only forms 20 distinct words, but rolls them out in clear-cut sentences. "I want my ball," "Let's go for a ride," and "No, I won't," are standard conversation phrases for Mr. Lucky, who made his first speech—"Aw, come on home now"—at the age of 10 months. His owner, Mrs. John T. Davis, brought him to the coast from Midvale, Utah, to do a documentary film which will be released this October. Big question in everybody's mind but Mr. Lucky's: has he the start of a motor speech center in his brain? If so, his sons may speak with a Boston accent.

MR. LUCKY'S OWNER could hardly believe her ears when her 10-month-old Boston terrier barked: "Aw, come on home now."

Walking Bed Aids Polio Victims

LEVERS on this adjustable steel frame move foot, leg and back supports which simulate walking action. An Allegan, Mich., electrician, Ralph Gross, designed the machine after his wife was stricken with polio. It puts practically all body muscles to work, and exercise may be increased by elevating frame.

▶▶▶ No need for chipped ice when you serve chilled drinks and salads with a new type of service ware which has a refrigerant sealed between its double walls. Tempinware is pre-chilled in refrigerator. It is sold by Redi Products, Pasadena, Calif.

Crib Clips to Baggage Rack

BABY gets an upper berth all to himself in this new rig under test by British Overseas Airways. Made of metal and plastic cloth, the crib has a side flap that clips up to hold baby safely in.

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FIRST TO CROSS FINISH LINE in the world's longest yacht race this summer—from Los Angeles to Honolulu—was the 161-foot schooner *Goodwill*, above. She made the 2,225-nautical-mile run in 11 days, 2 hours, 17 minutes, 24 seconds. Owned by Ralph E. Larrabee of Huntington Park, Calif., she cost $750,000, was manned by a crew of 45 unpaid amateurs. Thirty-two yachts in "Cocoanut Derby," from 36-footers up to the *Goodwill*, were valued at a total of $6,000,000. Other race pictures appear on next two pages.

Amateur sailors in $750,000 schooner finish first in

World's Longest Yacht

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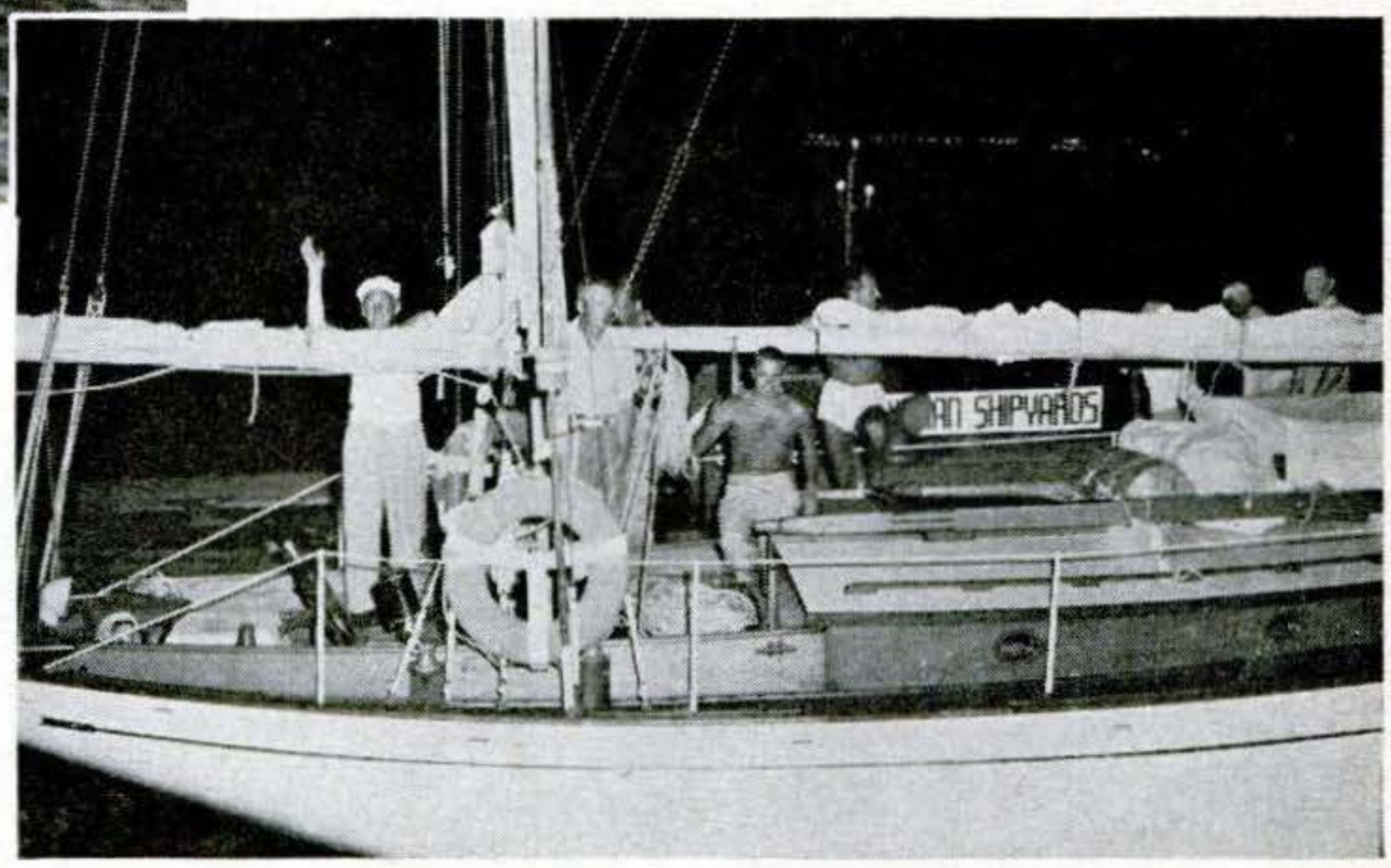
THEY'RE OFF: Smaller competitors are seen from deck of *Goodwill* as 32 yachts, closely bunched, crossed 1,000-yard starting line.

AT SEA: Three crewmen keep *Goodwill's* rudder steady in Pacific squall. Her top speed for the race was 15 knots in a 35-knot wind.



FINISH: Actual winner, because of handicap for her small size, was 39-foot *Staghound*, seen finishing in darkness a day behind *Goodwill*.

Race

Please turn the page for more pictures of yacht race.

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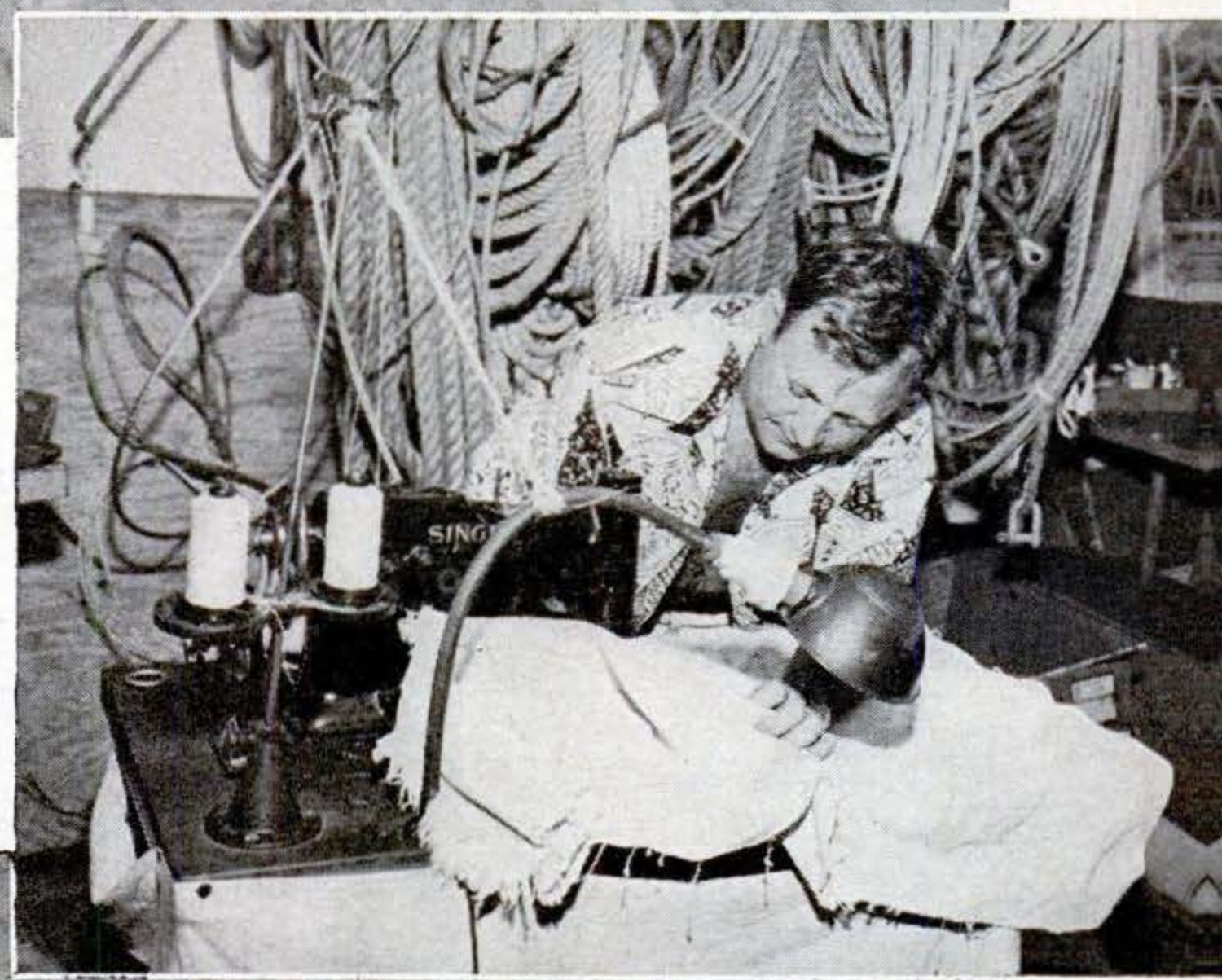
AT HONOLULU, after world's longest yacht race, Hawaiian boys watch crewman with diving lung go down to replace *Goodwill's* propeller taken off to cut drag during run.



BUSIEST MAN on board during race was sailmaker (right). Using sewing machine, he kept chafed canvas in repair and put together a complete sail to replace one torn by wind.

IN CALM MOMENT, crewmen (below) break out ukulele and guitar. Of some 300 men and half a dozen women on all entries, most were students or—for some reason—doctors.

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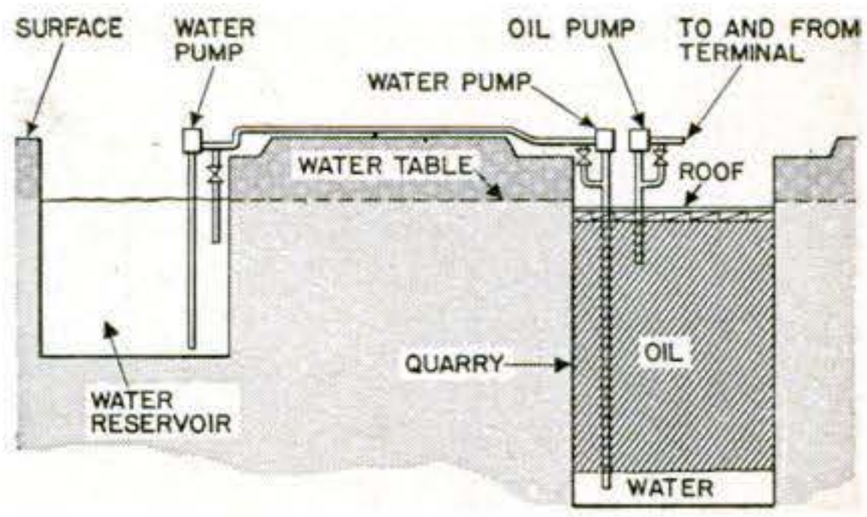
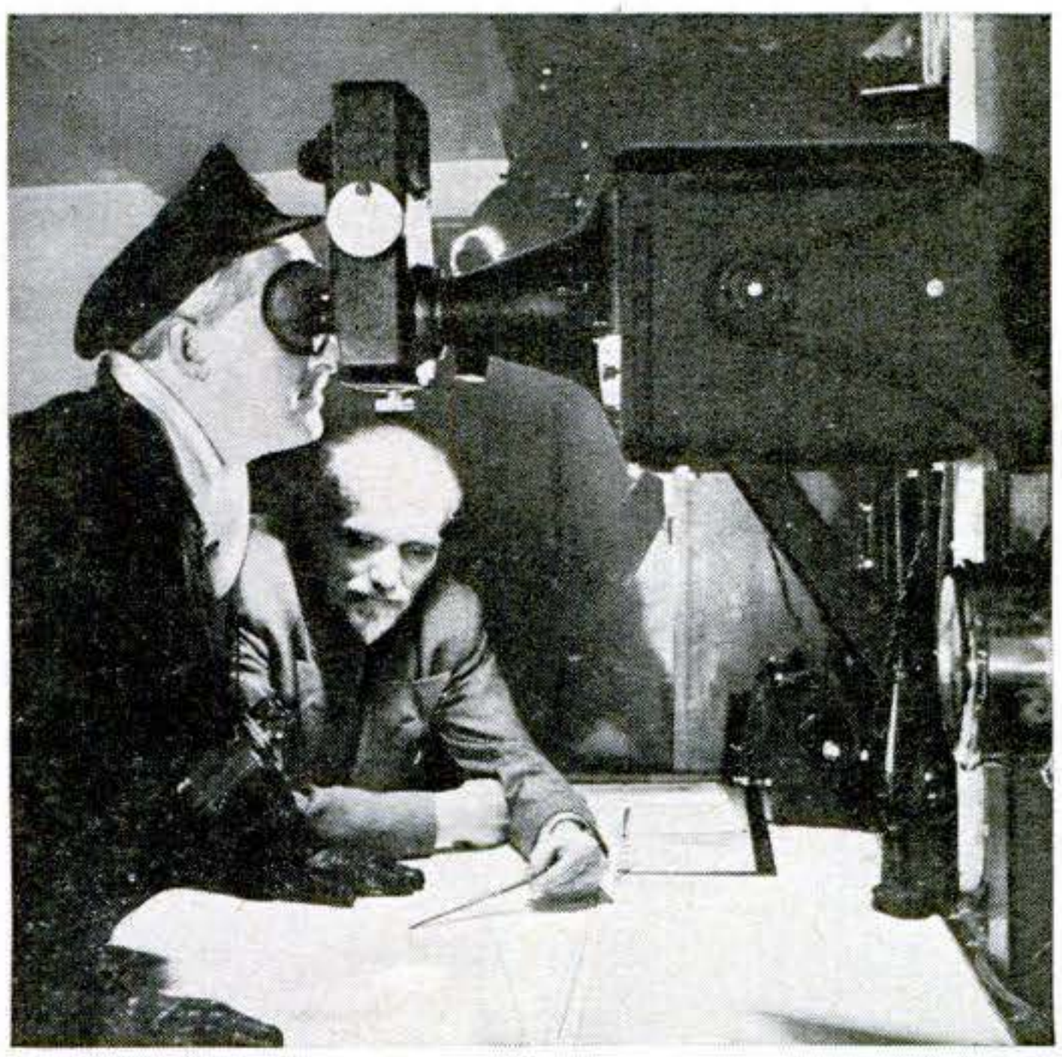


WATER FROM RESERVOIR, (at left on drawing) would be pumped in and out of oil pit to keep desired level. Light oil floats on water.

Abandoned Quarries May Make Cheap Oil Tanks

FUEL oil may soon be stored in abandoned slate quarries, such as the water-filled one above. One company hopes to save money by pumping oil from the Atlantic coast to empty pits near Bethlehem, Pa., pumping it back as needed. To keep it from seeping away, the oil must be kept below the local water-table level. To do this, regardless of the amount of oil stored, water kept in other pits nearby would be pumped in and out. Floating-pontoon or suspension roofs would keep out dirt, light and birds. Engineers are picking the deepest, narrowest pits, figure they would hold a winter's oil supply for 325,000 homes at a cost one-sixth to one-half that of steel-tank storage.



British Sharpen Radar's Eye

WITH a new radar unit that is able to tell instantly whether an object ahead is a rock or a ship, Royal Navy vessels now can move through dense fog or deep night as surely as cats.

The improved radar superimposes on its scope the reflected image of a navigation chart of the same scale. The user looks at the combined picture through an eyepiece (above). Meanwhile the unit shines an arrow on the chart below it to show the ship's position and heading.

▶▶▶ A new closet drier consists of a small metal tube, open at both ends and surrounded by an electric heating coil. Air circulating through the tube is heated to decrease the humidity and prevent mildew. The tube is plugged into any outlet and hung up in the closet. It is made by Airdri Associates, St. Petersburg, Fla.

"Fill 'er Up with Cold Air!"

TEXAS gas stations are delighting motorists with a new kind of free air. When a car stops for gas, a nozzle fixed to an air conditioner is poked in the window. Station attendants say temperature inside the car drops as much as 20 degrees in two minutes.

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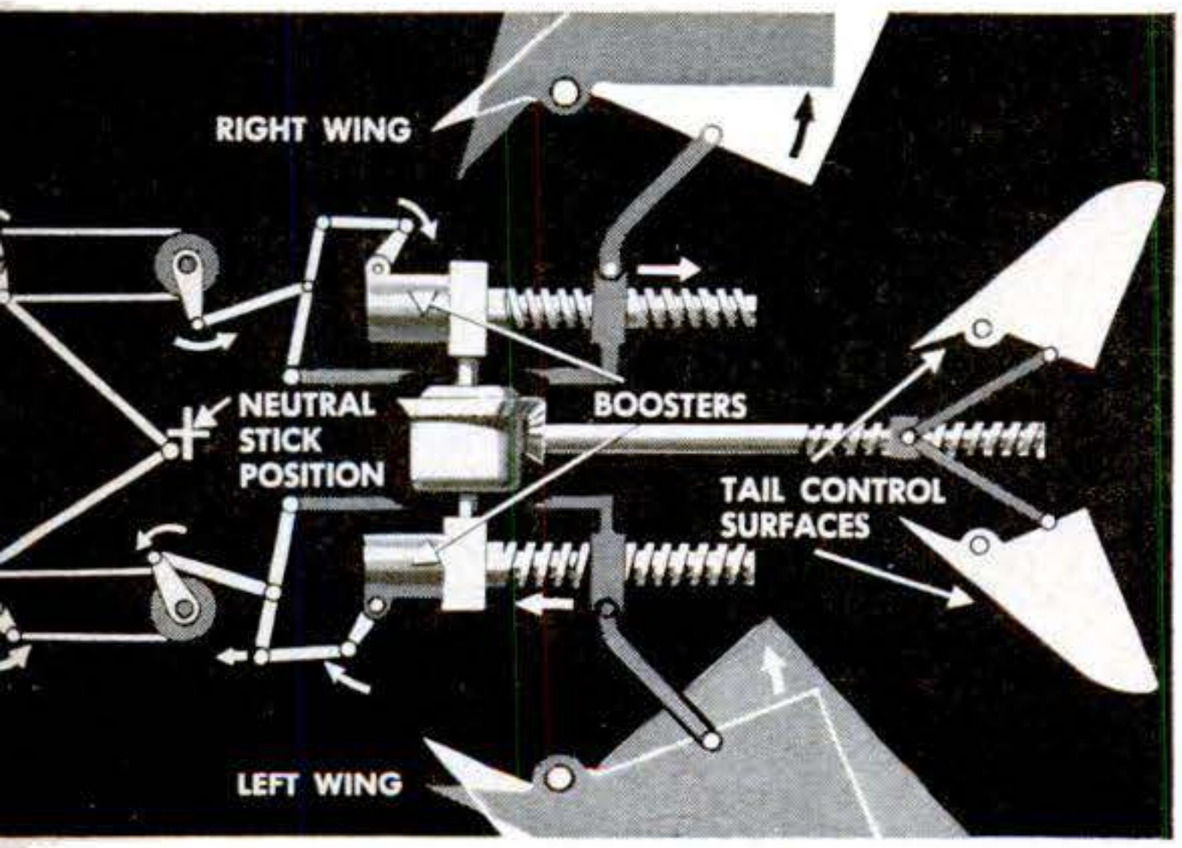
Pilot Moves Wings to Control Plane

The next thing to flying like the birds is to climb, dive and turn without benefit of ailerons, elevator or rudder.



SCHEMATIC DRAWING of wiggle-wing plane shows how movements of wings and tail surfaces are coordinated. Boosters amplify pilot's muscle. Pinion gear in center serves only to move tail surfaces back and forth.

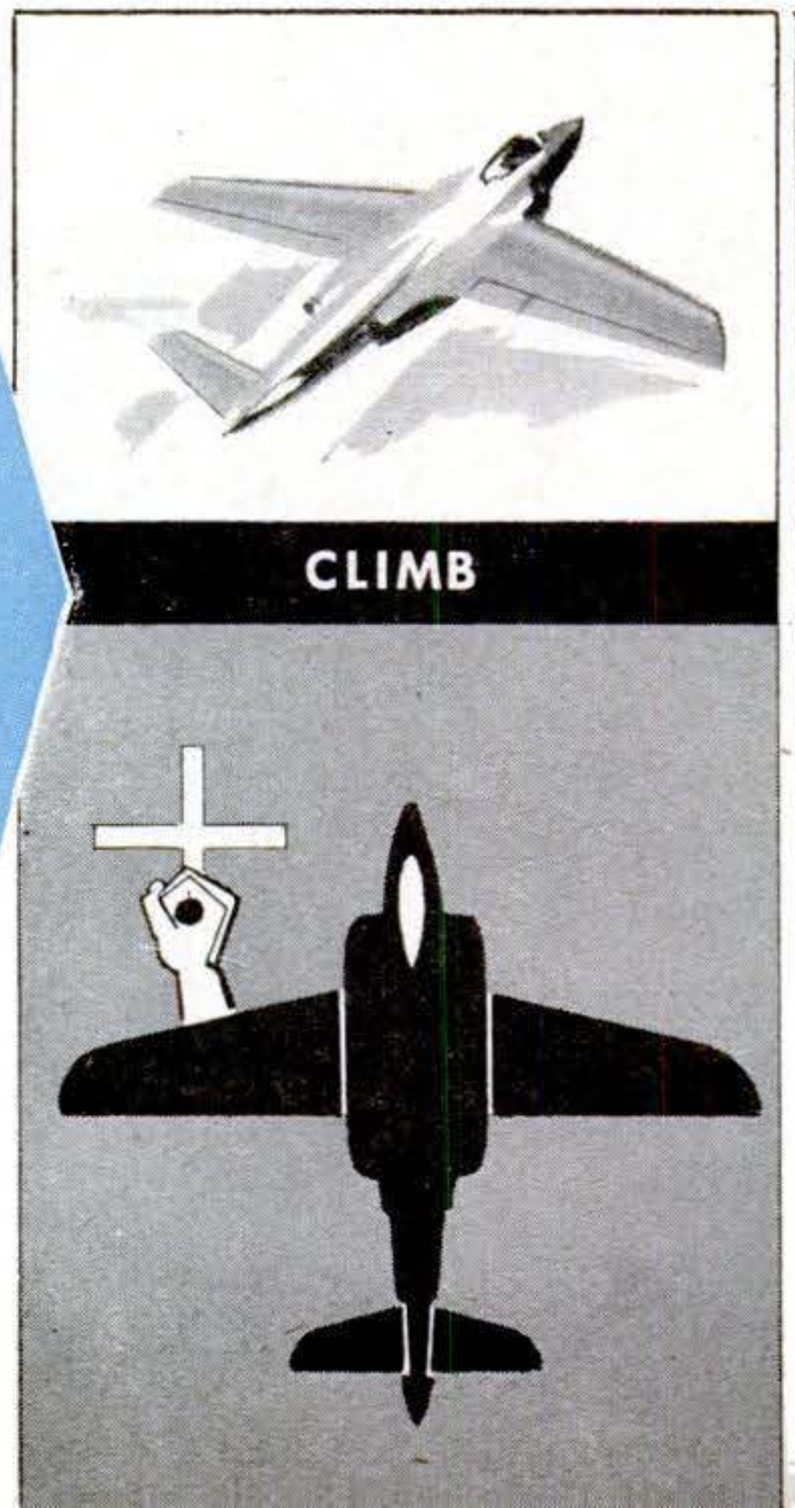
A BRITISH airplane designer is copying the birds to devise a new way to control airplanes in flight. He is experimenting with moving the wings of planes—particularly those flying at supersonic speed.

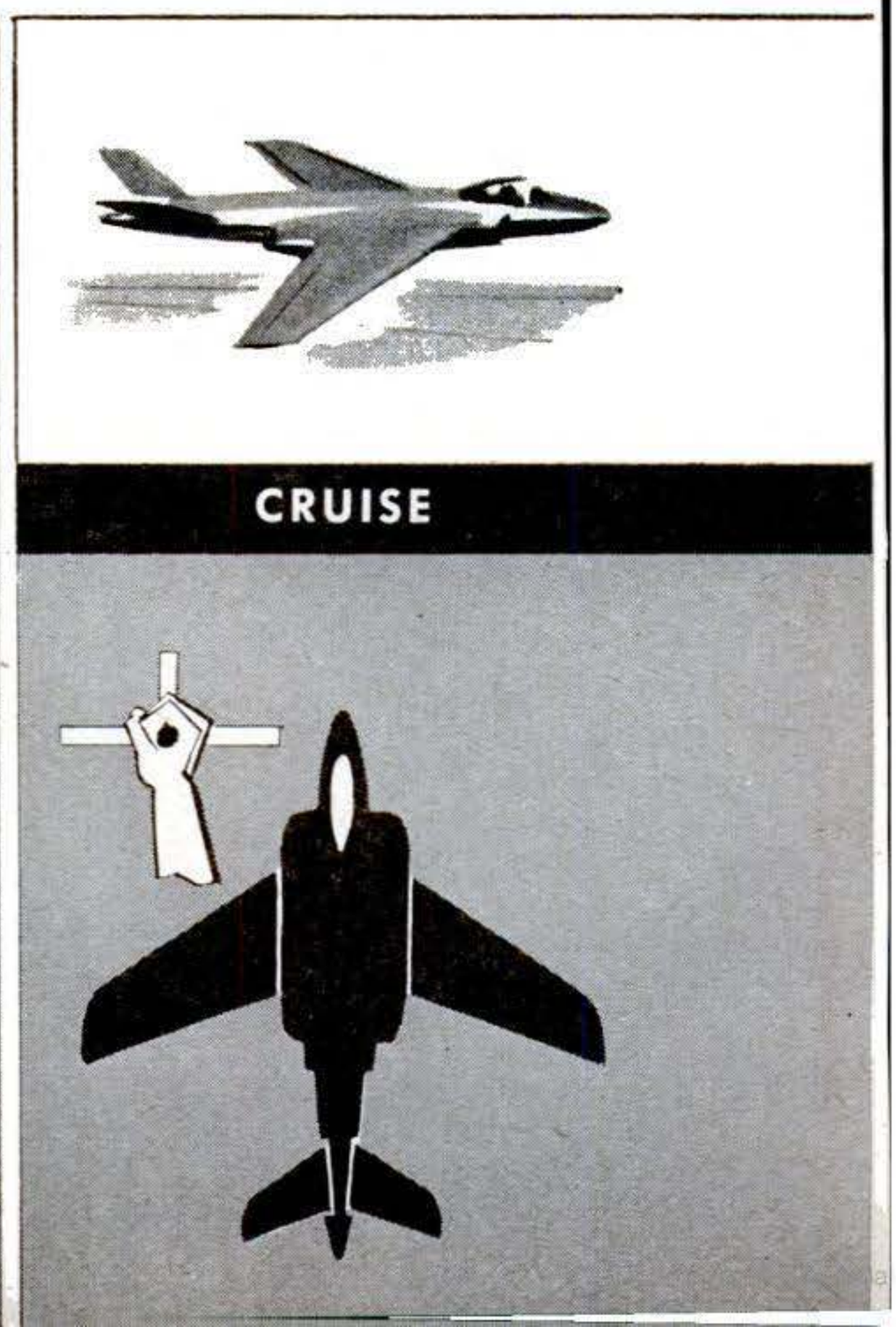
Instead of moving the wings up and down, he moves them back and forth. The wings on each side of the fuselage can be moved differentially—one forward, one backward—to make turns. Even the stabilizing tailplane moves.

If the design proves successful, it will represent the biggest change in the basic principles of flight control since the first man-carrying powered flight 50 years ago. The British designer has made

Single Control Governs Plane

PILOT climbs, dives and banks plane around its three axes of rotation by moving control stick alone. Conventional planes require coordination of stick and rudder. Big difference between this plane and Bell X-5 is differential sweeping of wings.





model tests, with radio control, of the new plane.

The experimental plane eliminates the conventional control surfaces. It gets all its control from wing sweep. For take-off and low-speed flight, the wings are in the forward position (see sketches). For high speed, the wings are swept back.

Swept wings do not have as much lift as straight ones, but planes so equipped can fly faster—they have less drag, less friction with the air.

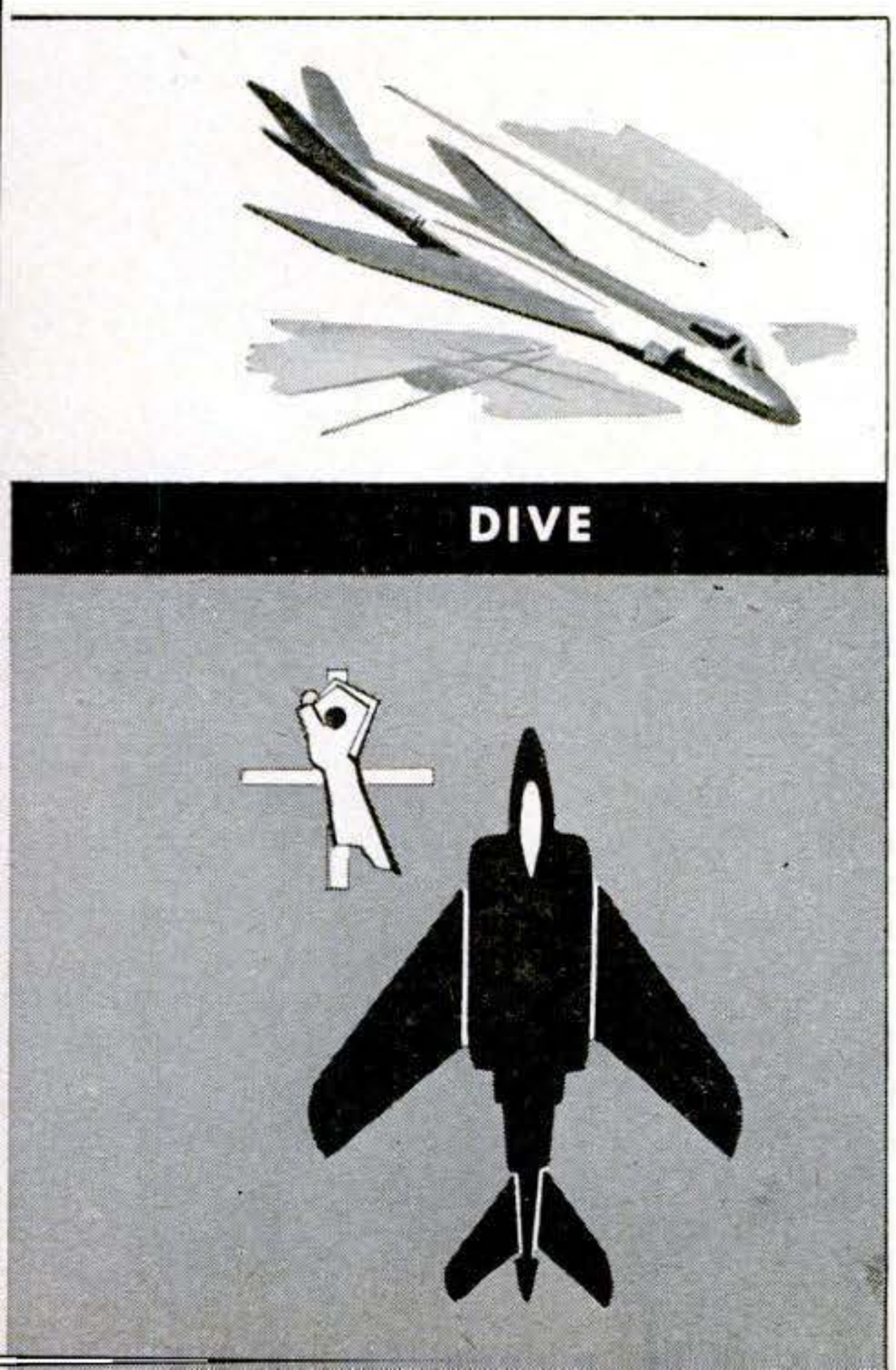
For turning, one wing is swept back, the other forward. The difference in lift cocks the plane up on one side and air pressure turns it.

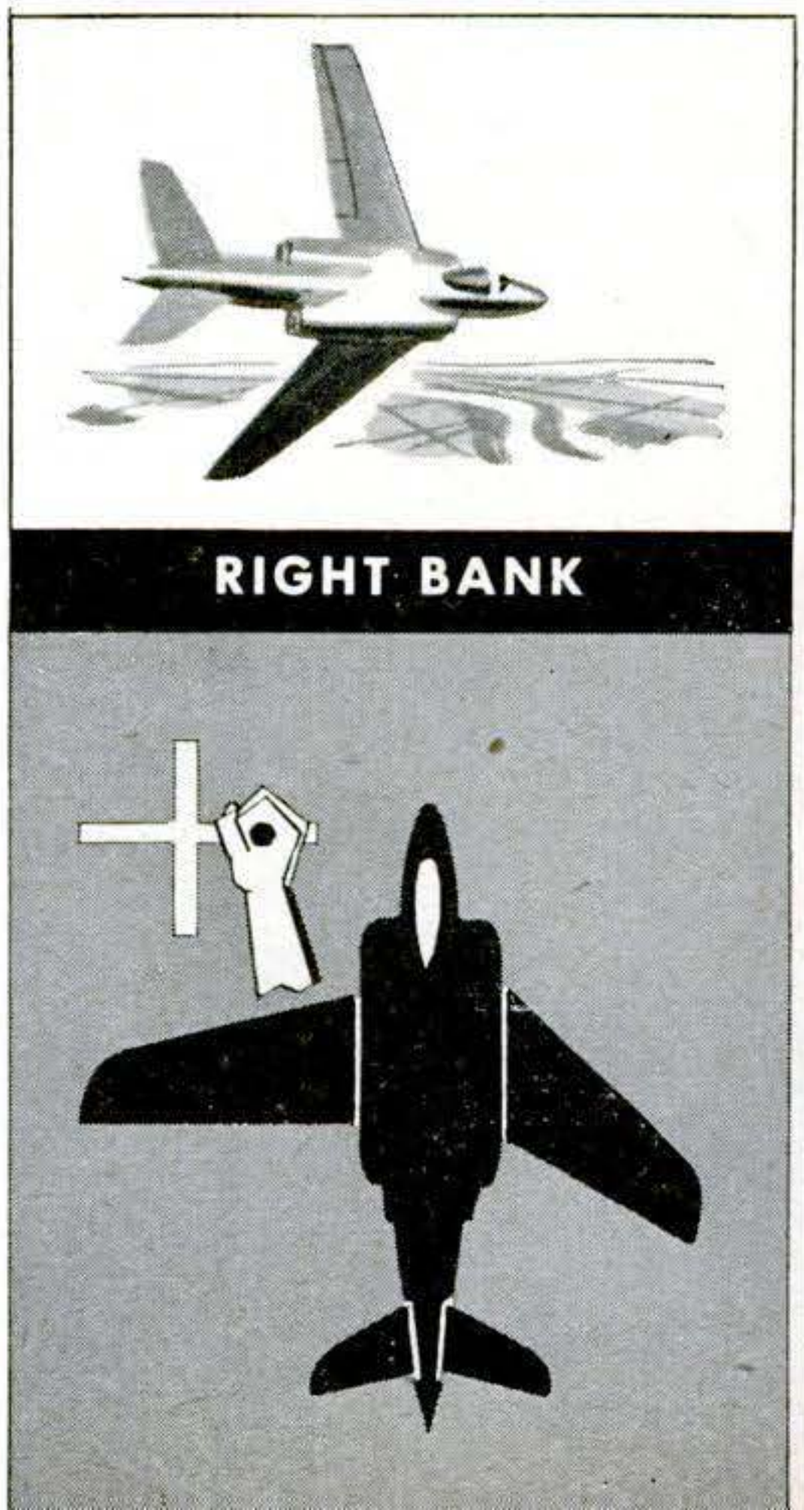
From level flight position, the plane dives by sweeping the wings farther back. It climbs by bringing them forward, increasing lift. The tailplane moves back and forth with the wings in order to maintain the plane's fore-and-aft balance.

In landing, both wings are swept forward. High-lift flaps, used as auxiliary lifting surfaces, are extended the full length of both wings since control ailerons are eliminated.

This isn't the first plane to sweep its wings back in flight (PSM, Aug. '51, p. 84), but it's the first to propose control by sweepback. END

WING MOVEMENTS are expected to afford a degree of control impossible to achieve with ailerons, elevator and rudder. Flaps to boost lift for landing and take-off will be more effective on a straight than swept wing.

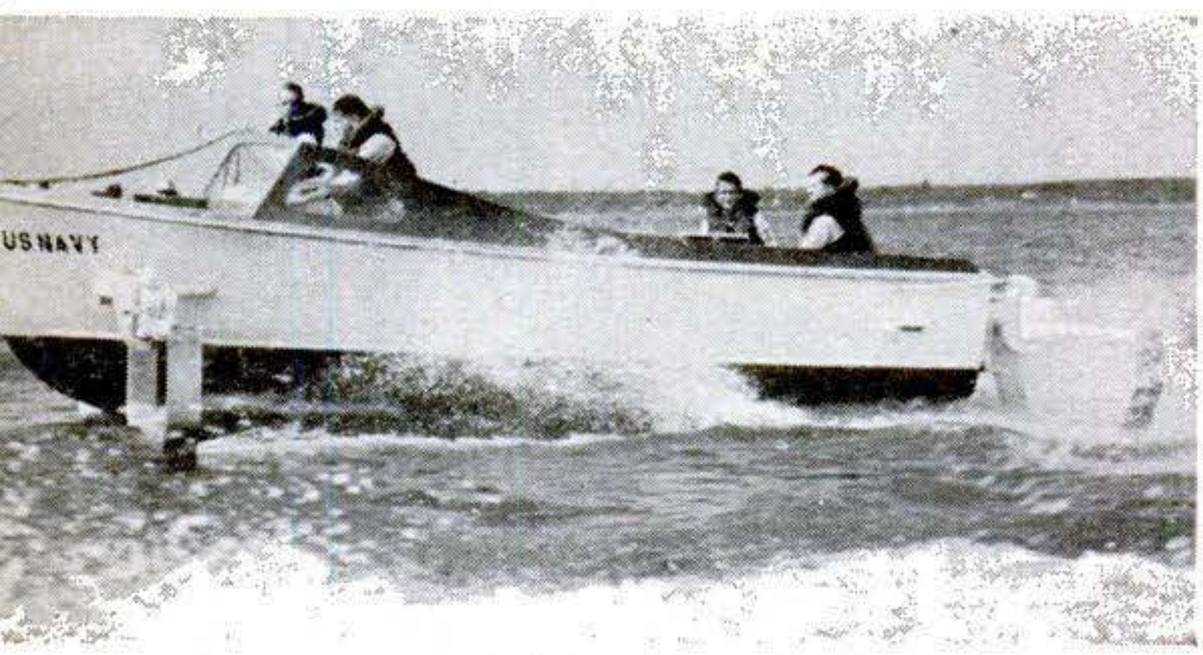




News from the Navy

Radio Paddles Speed Landing

A TWO-WAY radio with lip mike, controlled by push buttons on his signal paddles, lets this carrier landing officer talk directly to pilots when message is too complex for paddle signals alone.



Wings Give Boat a Lift

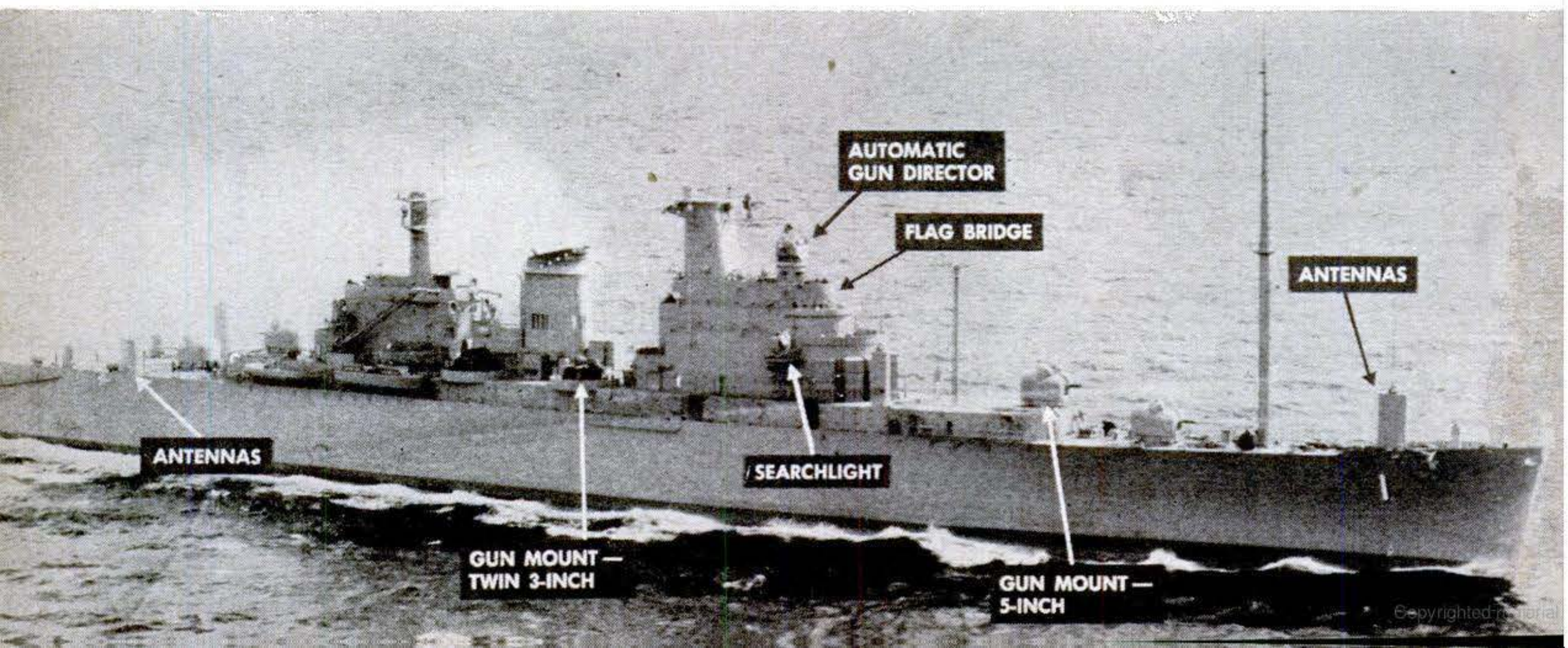
THE surface Navy has its own "wings" now. At high speeds this test craft lifts from the water and skims on planes called hydrofoils. Speed is greater, less power is needed, and the ride is smoother.

Helicopters Scout Ice Fields

OUR Navy's newest, largest, most powerful (21,000 hp.) icebreaker, shown above as a model, will not smash blindly through ice fields. The 8,300-ton ship's two helicopters (arrow) will scout floes ahead.

Atomic-Age Headquarters Ship Is No Sitting Duck

THE new USS *Northampton*, a light-cruiser-type command ship carrying five-inch guns, reveals lessons of the Bikini test. Operations commanders and communications centers require more speed and protection than given by converted liners in World War II. Ship's streamlined superstructure, air conditioning, and extra-strong hull are tailored to atom war. Even radar antennas are armored.



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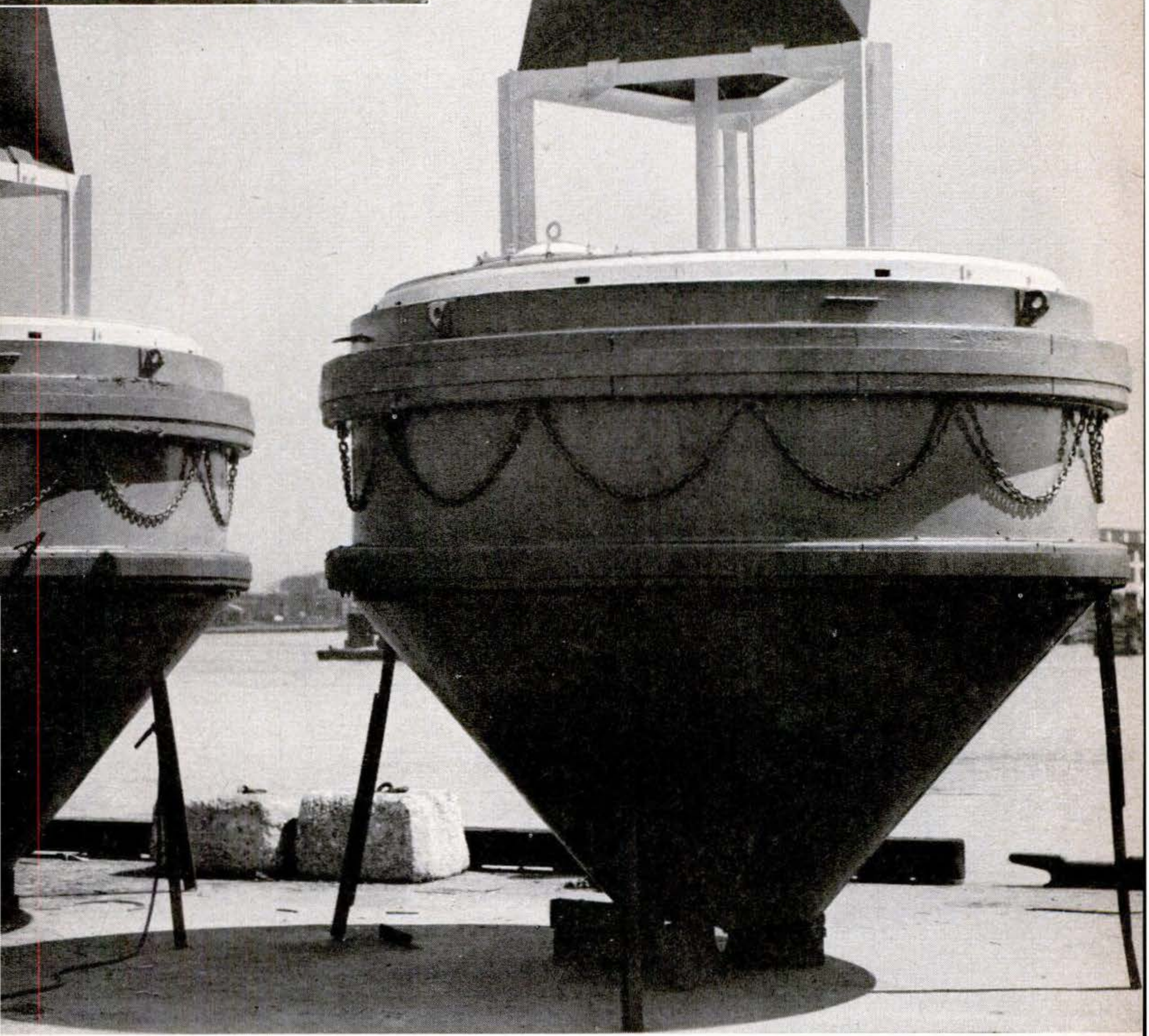

Radar-Reflector Target Buoys Double for Enemy Submarines

ANCHORED 25 miles offshore, these radar-reflector target buoys aid in the study of low-level air-attack problems. They bounce back radar signals to the scopes on attacking planes, simulating the blips of actual subs. The reflectors, made of quarter-inch steel, form three planes, each five feet eight inches square, standing at right angles to each other and intersecting along their diagonals. The 10-foot-high buoys, a standard mooring type, mount battery-powered blinker lights and are chain-anchored.

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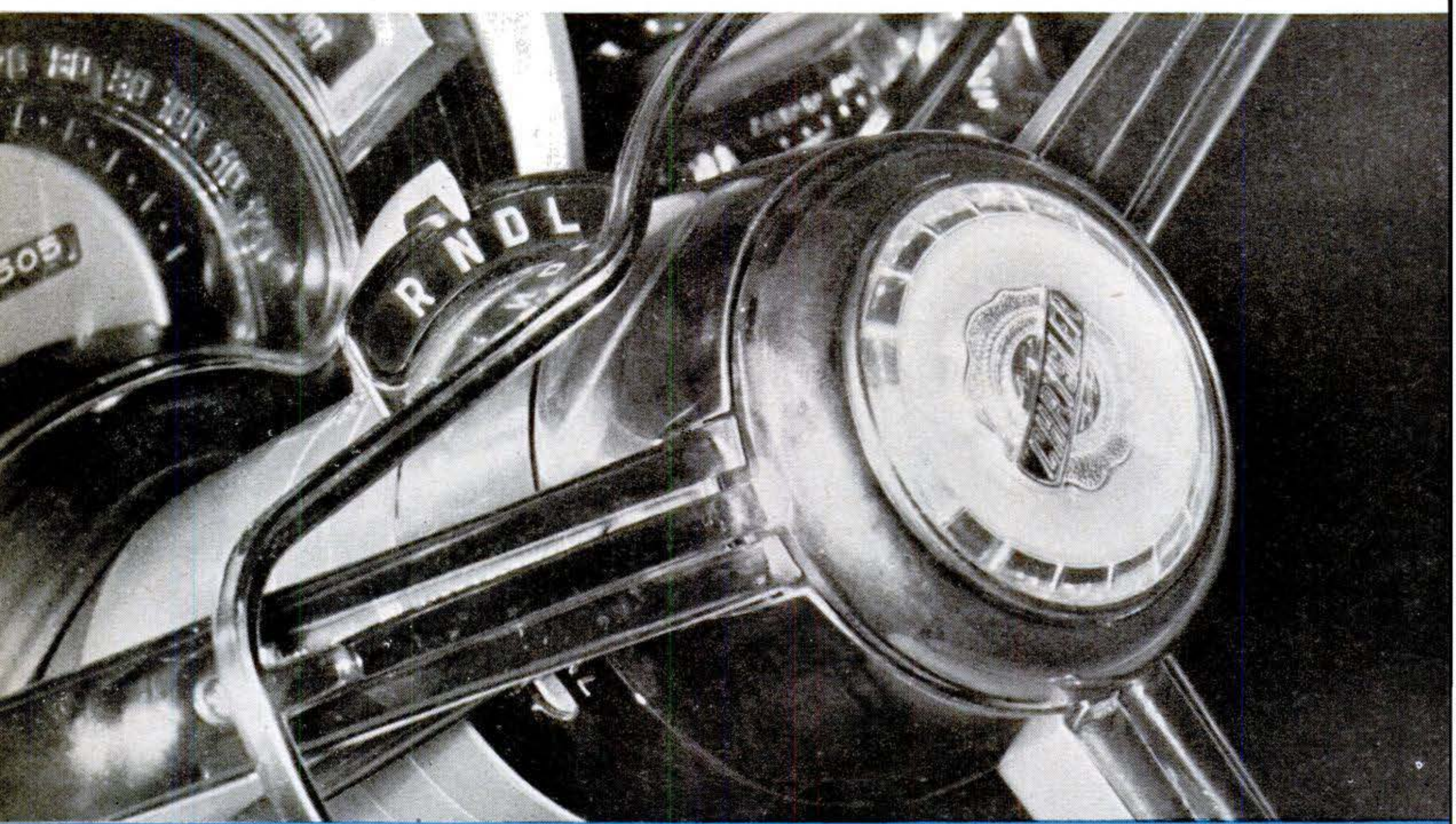
You Can Break Away Faster with

Detroit's Newest



The PowerFlite is Chrysler's nomination in the Green Light Stakes. It looks good on the chart.

CHRYSLER has a new, fully automatic transmission. (Cries of "At last!" from friendly critics of the company will be temporarily ignored.) It is, in truth, a sweet basket of gears, with features that include:

- Sassy getaway, right in the running with the best U. S. entries in the Green Light Stakes;
- No clutch pedal, and upshift without accelerator ease-up—both for the first time in Chrysler-built cars—and
- Notably fewer parts and pounds than any other automatic now on the market.

Currently available on Crown and Custom Imperial models, the new drive has been christened the "PowerFlite" transmission by the salespeople. Around the

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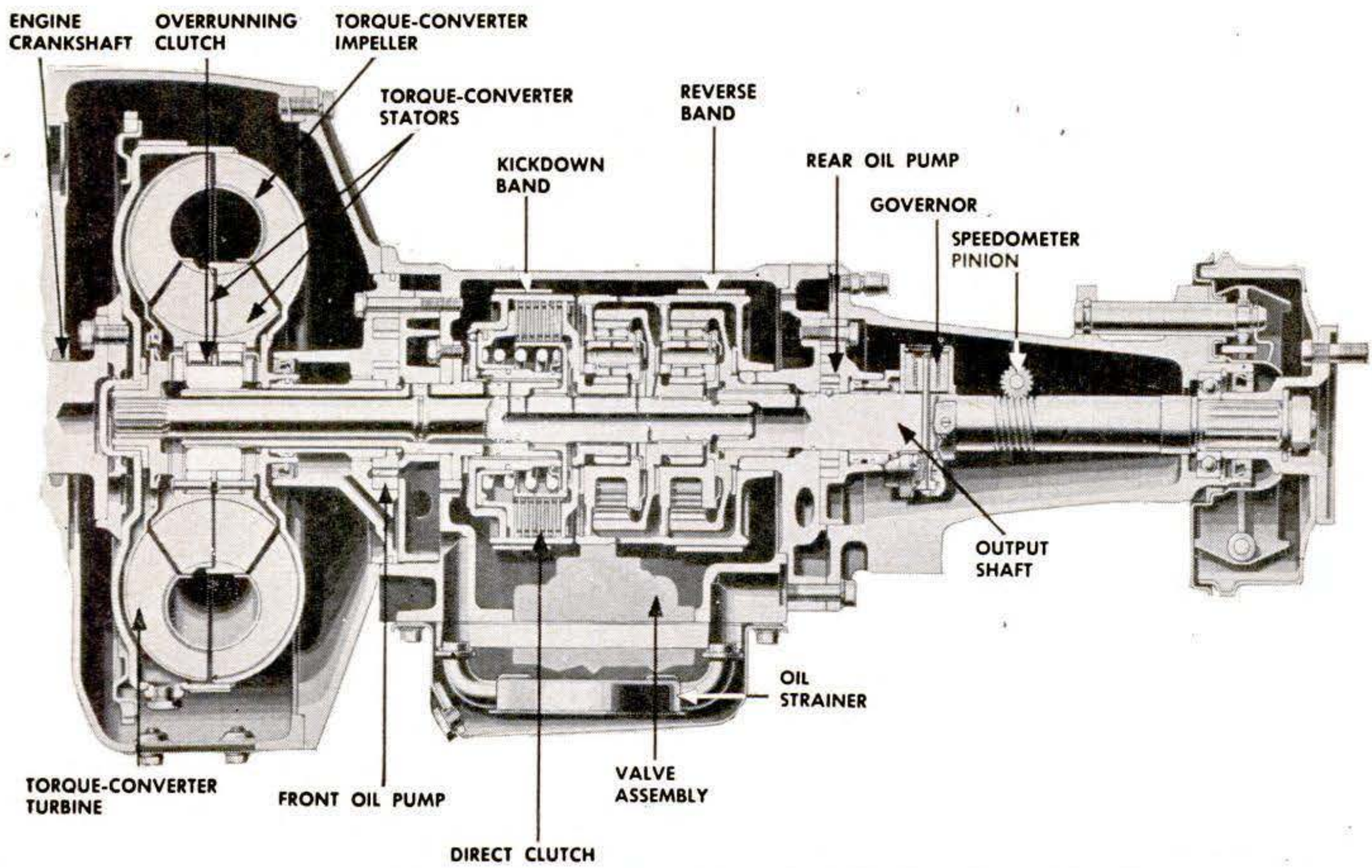
Basket of Gears



shop Chrysler engineers call it the "A323 job" and regard it with real pride. This reporter, having poked cautiously into its innards and having put some miles on it, is almost tempted to give up his long-time love affair with manual-plus-overdrive. If you like automatics, you'll find that PowerFlite is one of the best; if you dislike them, it may even change your mind.

What's inside? A323 uses a torque converter feeding into an automatic planetary gearbox, which is roughly the same as every other U. S. automatic except Hydra-Matic. What makes it good is that Chrysler has put a big chunk of engineering time and money into boosting torque-converter performance, and into smoothing out the valve, clutch, and servo actions into silken inconspicuousness. You start out without wallowing in wasted revs; once rolling you have to stay alert to detect the up- or downshift.

A323's converter has the highest starting torque ratio in the industry. This ratio, 2.6 to 1, means that at the moment of start the converter is doing more to help the engine get the car rolling than any other U. S. converter. Since Chrysler's big V-8 pours out a potent 312 foot-pounds of torque at comparatively low speed, she gets off like a gone goose.

There's Little Slip When It's Coupled

Up toward the other end of the range, when the converter is all through converting, the unit has remarkably little slip. Slip—the revs an engine delivers that never get through to the drive shaft—are reported to be a piddling 1.9 to 2 percent

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when she's "coupled"—when the converter stators start to free-wheel and the gadget changes itself into a fluid coupling.

To fathom the niceties of torque-converter design you need to be a slide-rule guy with knobs on. It's possible, however, to follow Chrysler along certain of the paths by which this converter was achieved. There are at least four main elements that a development engineer must juggle:

1. Diameter. The smaller a converter is the less it costs and the less humpy the floor in front; the larger it is, the better are its performance characteristics.

2. Torque multiplication. This is what you are mainly after, so the more the better, if you don't have to pay in a falling-off somewhere else.

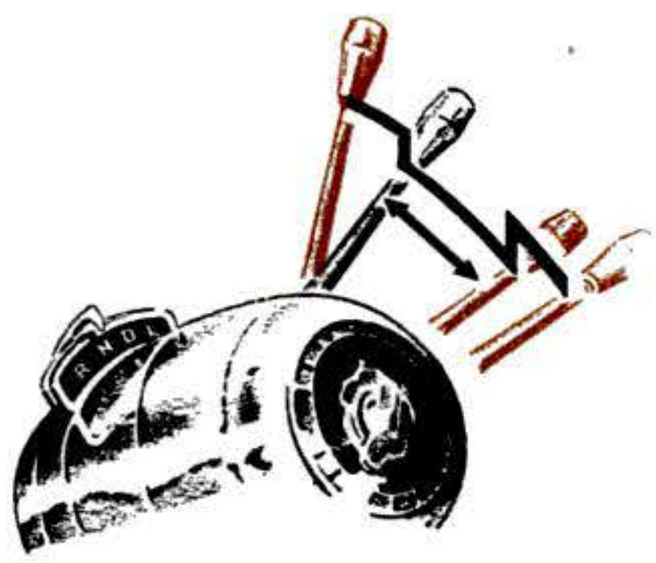
3. Stall speed. This reflects how high the engine winds up on starting, and wants to be kept as low as possible. (Weakness in this department was the big complaint directed at early Dynaflows.)

4. Efficiency. The less gasoline-fired heat thrown away in an oil radiator or in air-cooling vents, and the less engine energy spent in slip, the less a torque converter will cost to run.

Each of these elements is tied to the others. A designer can gain a lot on torque or efficiency, say, if he'll take a licking on stall speed or use a whopping big converter. To find a balance where all factors are nicely adjusted is a critical part of turning out a good design. Especially when the designer must also sweat over getting some engine braking, tailoring the converter to suit the engine's curves, and specifying turbine and impeller blading that can be built at competitive costs.

There is just one forward shift in the A323 gearbox. The upshift takes place at 15 to 65 m.p.h., depending on throttle position. ("Takes place" should not be interpreted to mean the leisurely kerplunk that Chrysler's old semiautomatic box delivered when your foot came off the gas. This job shifts quick and quiet, with no break in the power flow.) The downshift, also dead smooth, is governed by car speed rather than accelerator position, and always occurs as you drop down past 11 m.p.h.

When the planetary gears are at the lower speed they have a 1.72-to-1 torque ratio. Multiplied by the converter's 2.6, the whole basket of tricks socks out 4.47-to-1 torque multiplication at breakaway. This is more than any other U. S. automatic transmission with the lever in the Drive position, though others will give more if you start out in Low.



"NO-LOOKY" shift is fine for parking in tight quarters or rocking mired car: you just lift the lever a bit toward you and slap it up or down. If you don't lift, the gate restricts you to Neutral or Drive. As on other automatics, the starter works only in Neutral.

There is also a kickdown. If you floorboard the accelerator when she's upshifted, you drop back from 1-to-1 to 1.72-to-1 gearing, with correspondingly sharper response. This is one shift that is not dead smooth. You'll readily notice it, even though it isn't like the hiccough of an overdrive kickdown, where the poor engine has to be killed for a split second. Valving of the kickdown servo is set so you can't knock her down above 55 m.p.h. This wouldn't do any harm, but the revs at a high-speed kickdown would climb off the most useful part of the engine's power curve.

Chrysler is especially pleased with A323's shift pattern. As a drawing shows, a "gate" on the lever's movement lets you engage each range by feel, without checking the pointer. Fast changes for rocking or parking can be done without looking. Neutral is spotted between Reverse and Drive—you don't have to go through a forward gear to back up. It's an easy arrangement to drive with.

There is no Park on the quadrant, a fact that reflects Chrysler's affection for its mechanical hand brake, located just

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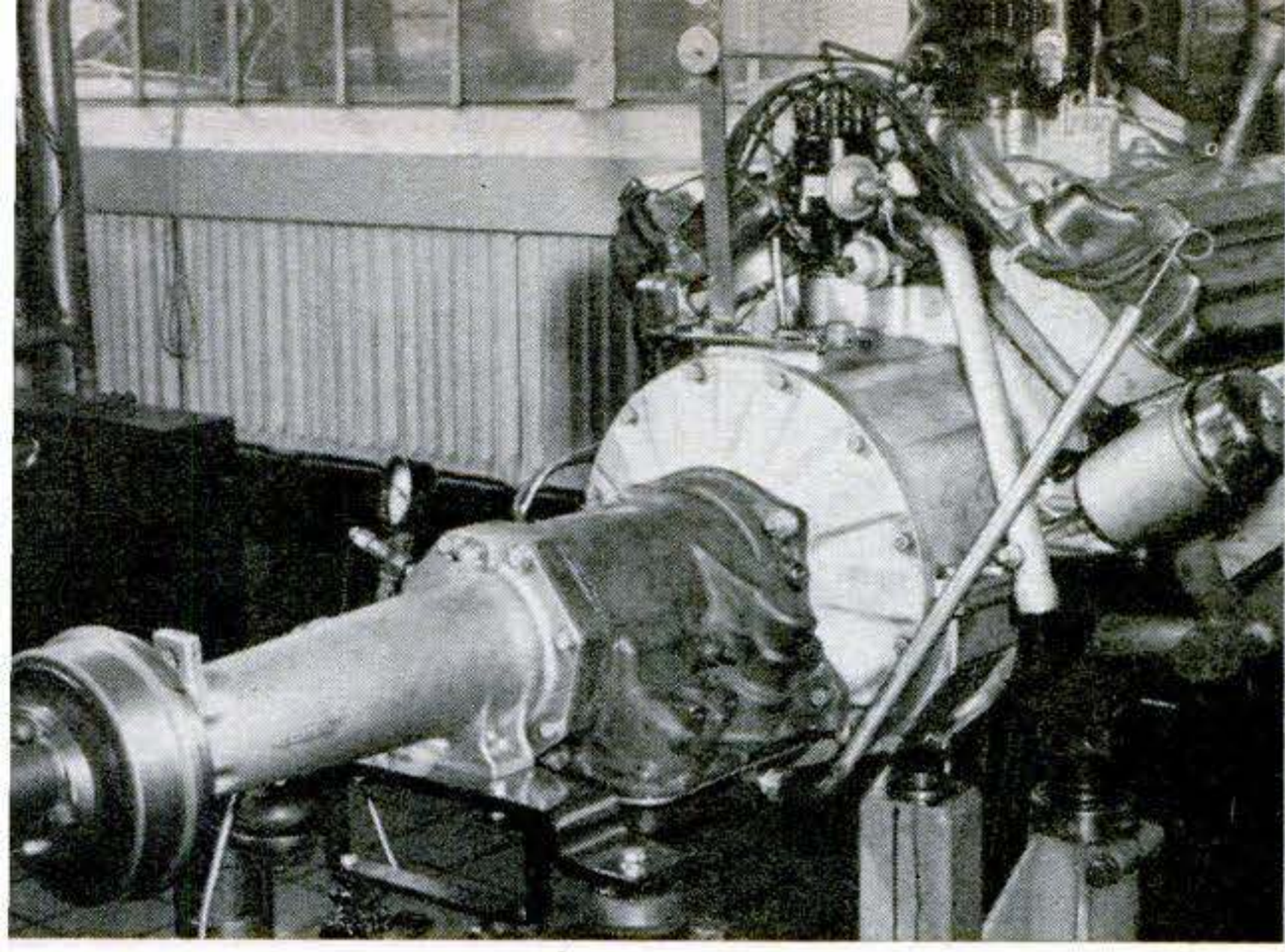
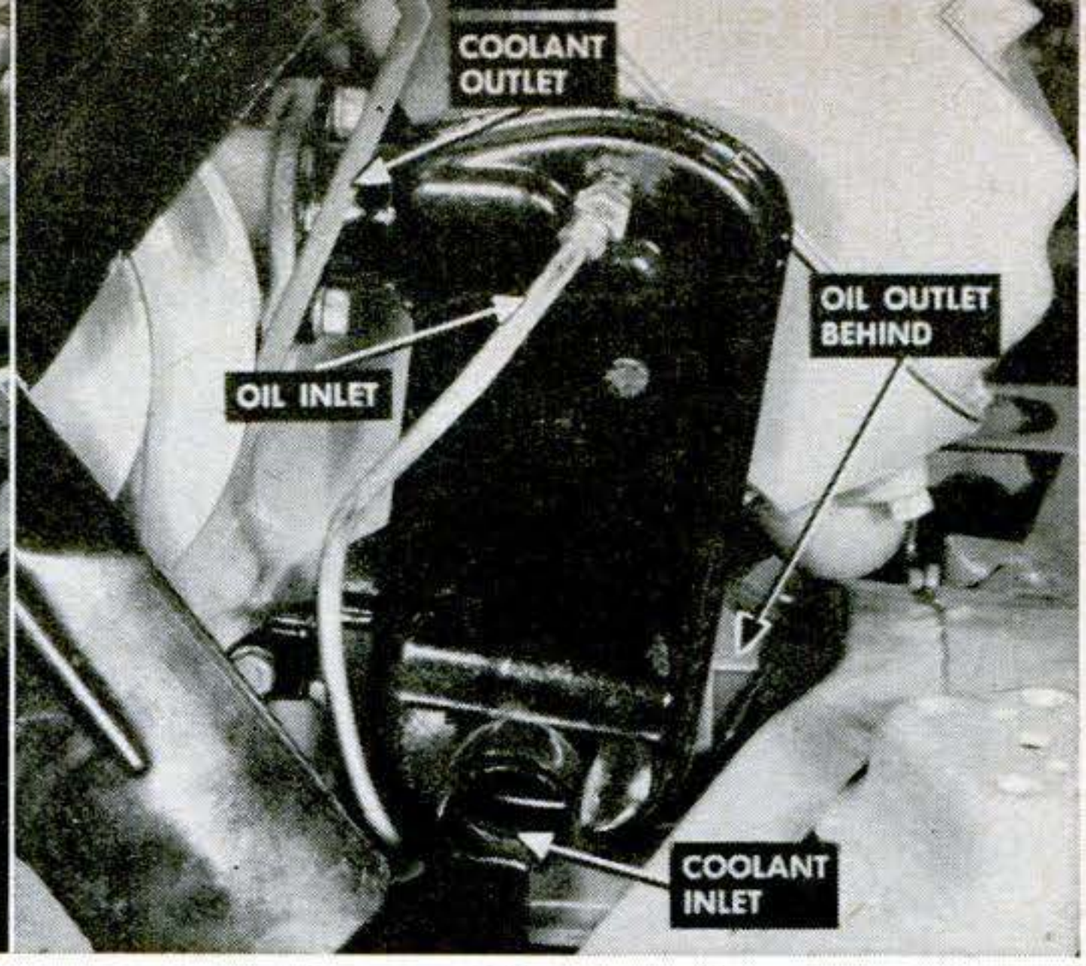


SMALL BUT POTENT, the A323 transmission weighs only 214 pounds, 14 less than the lightest other automatic, which is built to handle 50 less horsepower. Housings and many other parts, including valve bodies, are made of pressure-cast light alloy.



OIL COOLER is a small heat exchanger mounted in front of the left cylinder bank. Thermostats governing coolant temperatures effectively control the temperature of oil in the transmission, which is entirely separate from the engine oil.

astern of the transmission. Thereby hangs a tale:

In the early days a car's emergency brake was a sort of panic lever to haul back on when the two-wheel mechanical brakes weren't doing the trick. With the coming of four-wheel hydraulics this panic function became less vital; the emergency gave way by imperceptible stages to the parking brake, a device supposed to hold the car put when you left it on a hill.

Pistol-grip levers and Bowden-wire controls—designed for easy release by women—tended to slacken up in time, and by the late Thirties most parking brakes were sorry sisters after they'd had some use. It didn't seem to matter much: when you parked on a hill you always left it in gear to backstop the brake.

This comfortably sloppy situation was upset when fluid couplings and torque converters appeared. Reason: with a liquid link in the power train, there isn't any absolute security in leaving a car in gear. As a result most makers went initially to the Park idea—a pawl or "sprag" that could be engaged to lock the drive shaft positively. This has drawbacks: it is hard to build a pawl that won't sometimes maliciously lock itself in under load; it is costly; and it may need an interlock to keep dimwits from engaging it while the car is rolling briskly, thus munching up the mechanism.

Chrysler was one company that elected to have none of this. Instead, they concentrated on the brake. The emergency brake on the A323 has, the company claims, the highest holding power in the industry. It will effectively hold the car on any grade where the rear wheels won't slide. It is an internal expanding mechanical brake mounted at the back of the transmission, where it benefits from the 3.36-to-1 torque multiplication of the rear-axle gears. Being physically separate from the service brakes, it won't be affected by any heating fade that might weaken them, a comfort going down a mountain. The company says it will genuinely function as an emergency brake.

No Extra-Low Gear Ratio

Despite the L on the quadrant, there is no heavy-pull, extra-low gear on A323. When you move the pointer to L you merely lock out the automatic upshift—you get no more torque than you'd have in Drive if you didn't let it upshift. Elimination of the extra planetary gearset and its control mechanisms saves Chrysler both weight and money. Whether there'll be enough moxie to lug an overloaded sedan in prolonged heavy going remains to be seen; Chrysler obviously thinks that its big engine needs no extra assist. The decision to omit this gearset may make more sense when you ponder the big

[Continued on page 260]

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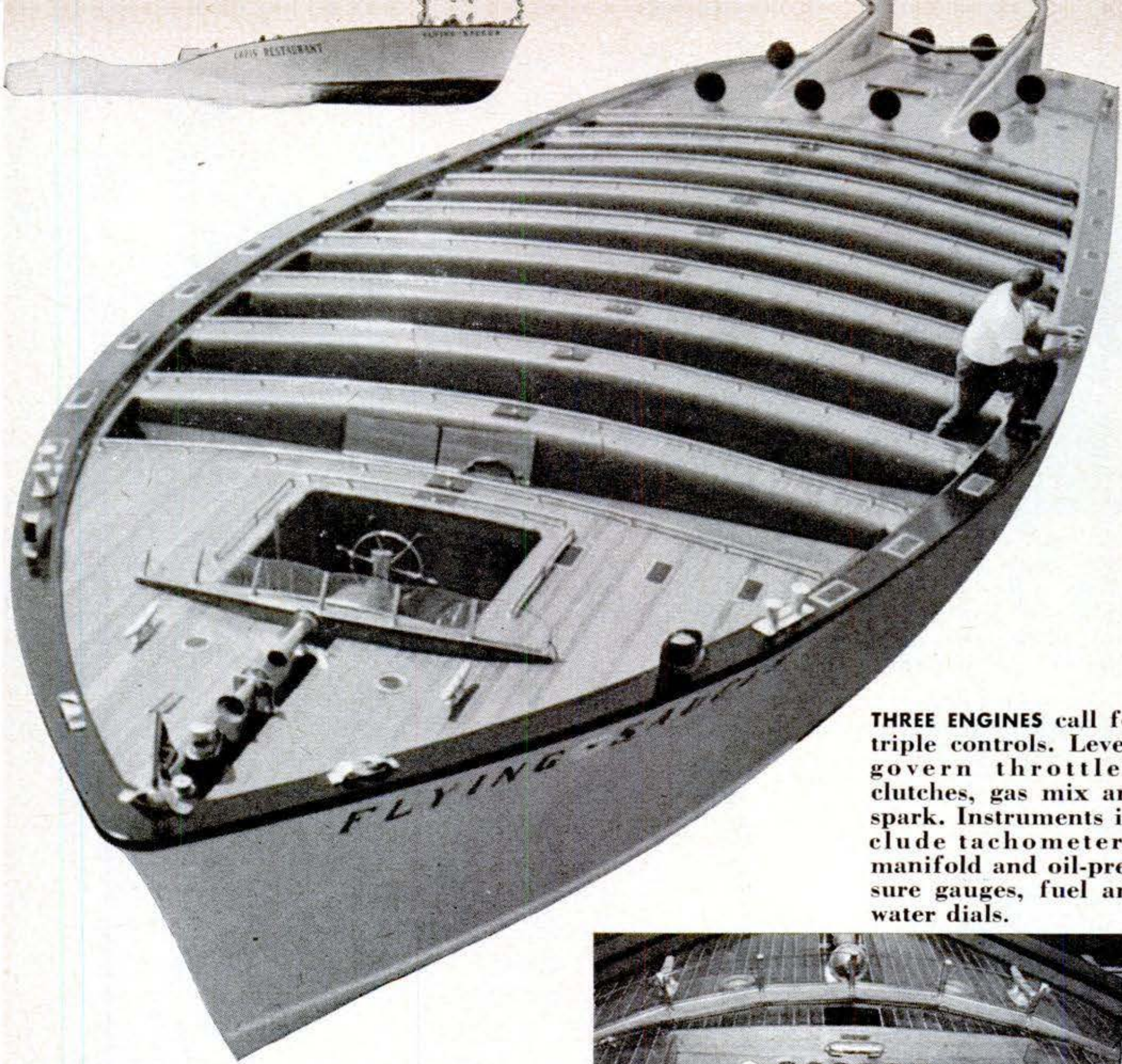
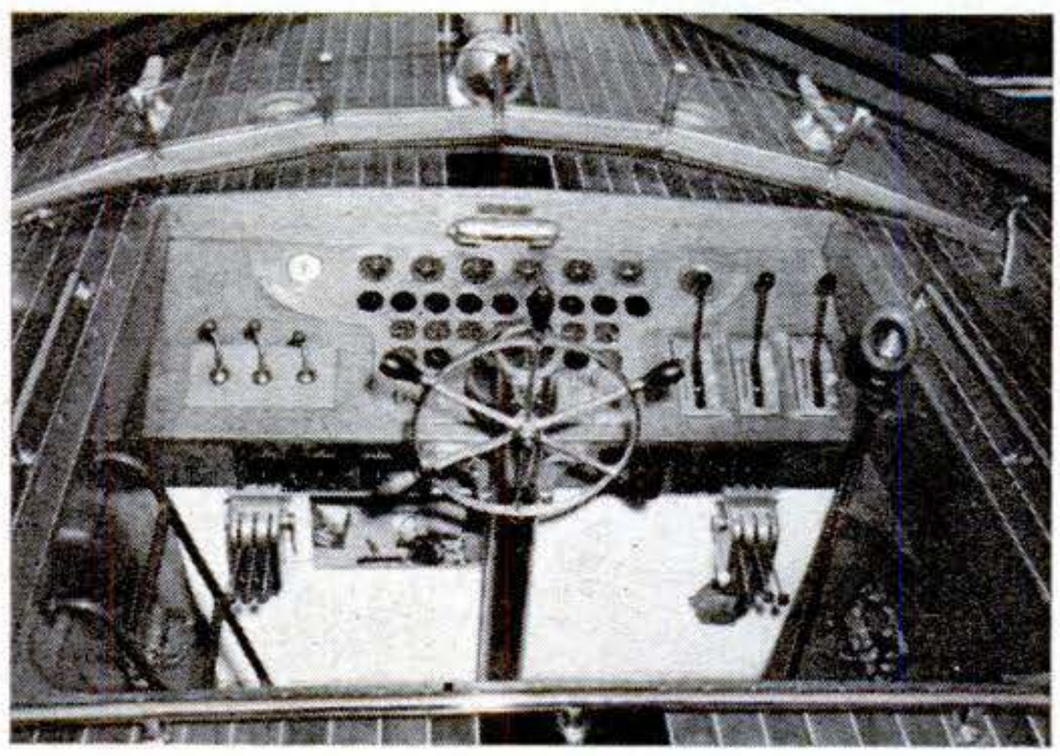


THREE ENGINES call for triple controls. Levers govern throttles, clutches, gas mix and spark. Instruments include tachometers, manifold and oil-pressure gauges, fuel and water dials.



BUILDER doesn't know why he provided comfortable blue-leather upholstered seats. Most passengers use them only for footrests, sit on seat backs, hooting and hollering as salt spray whips over them.

Rebuilt PT Is World's Largest Speedboat

PLATTERING over the waves at 90 miles an hour, a 125-passenger speedboat named the "Flying Saucer" offers vacationists at Ocean City, N. J., the world's fastest regularly scheduled motorboat rides. The designer-operator of the huge spray maker is a local restaurant owner, Chris Montagna, who has been dishing up high-powered hobby boats for more than 20 years.

Chief ingredient of the "Flying Saucer" is a war-surplus motor torpedo boat, completely rehulled with the exception of her double-planked mahogany bottom. The three big Packard engines which drove the PT through hostile Pacific waters during World War II have been souped up from their original total of 4,200 horsepower to 5,400. New hydraulic controls and twin air fins synchronized with her rudders make the "Saucer" as responsive as a marlin on the hook.

To meet excursion-boat requirements, the 75-foot craft has fire-fighting equipment spotted at strategic points below deck, which can be actuated from the control cockpit. She carries three fuel tanks with a total capacity of 1,200 gallons—enough to feed her greedy engines for four hours at full throttle.

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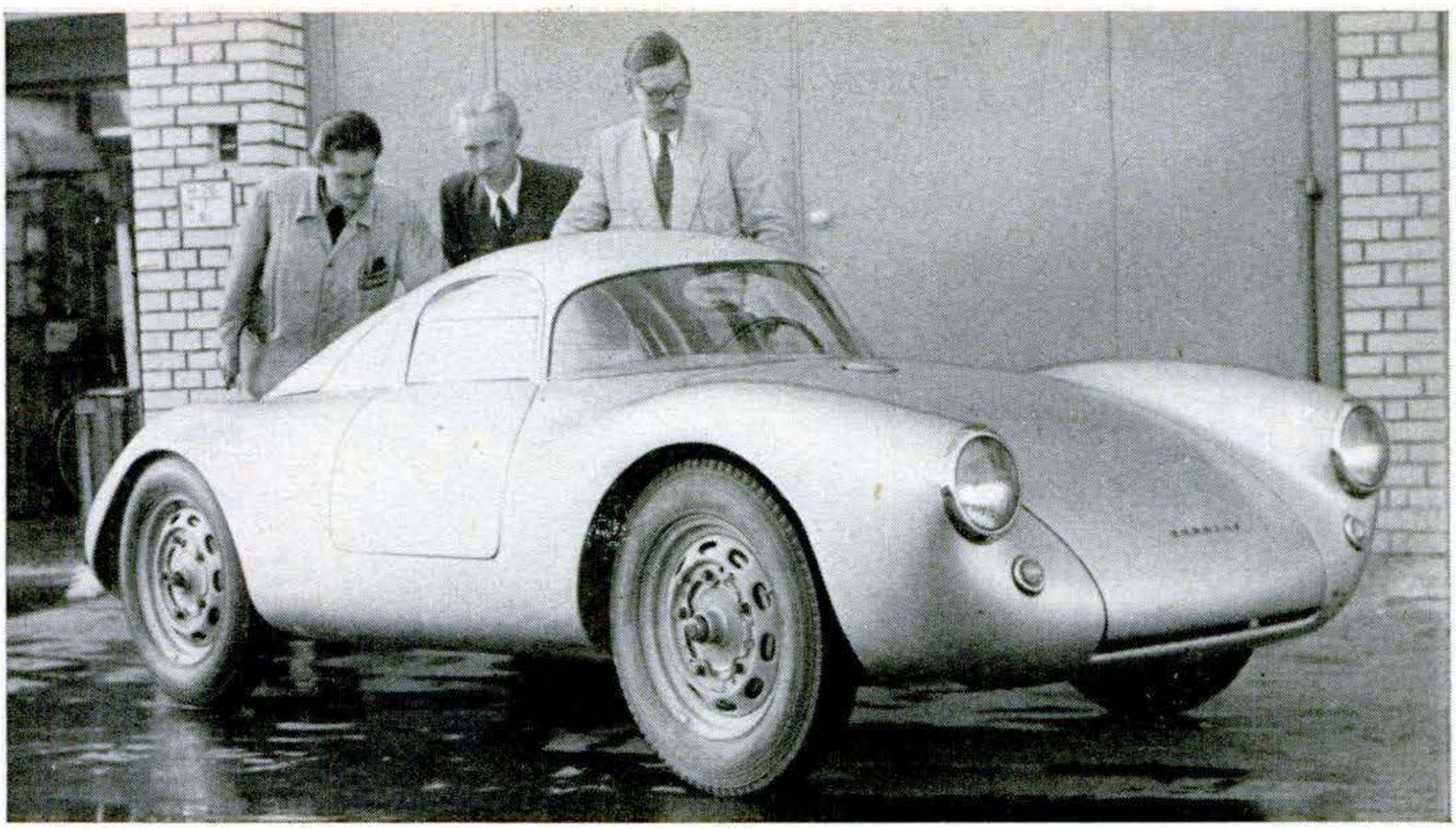

New German Sports Car Called 125-Mile-an-Hour Speedster

A RECENT entry in the sports-car field is this Porsche racer from Germany—a more powerful and faster machine than the model previously offered by the same maker. Power has been boosted from 70 to 80 horsepower and maximum speed, it is reported, from about 110 to 125 miles an hour. Body design has been revamped, too, with the result that the new model has a body a few inches lower than its predecessor.

Kids Go for Stationary Car

ALL but one of these small fry are saying in German, "My turn next!" An old Volkswagen body, mounted immobile in a U.S.-sector Berlin playground, has proved a big attraction there. Wheel and horn work.

Speaker Unties Knotted Traffic

LOUDSPEAKERS help untangle traffic jams, a British trial shows. Above, a policewoman demonstrates a speaker used to direct motorists at Ascot, England, during racing events attracting heavy crowds.

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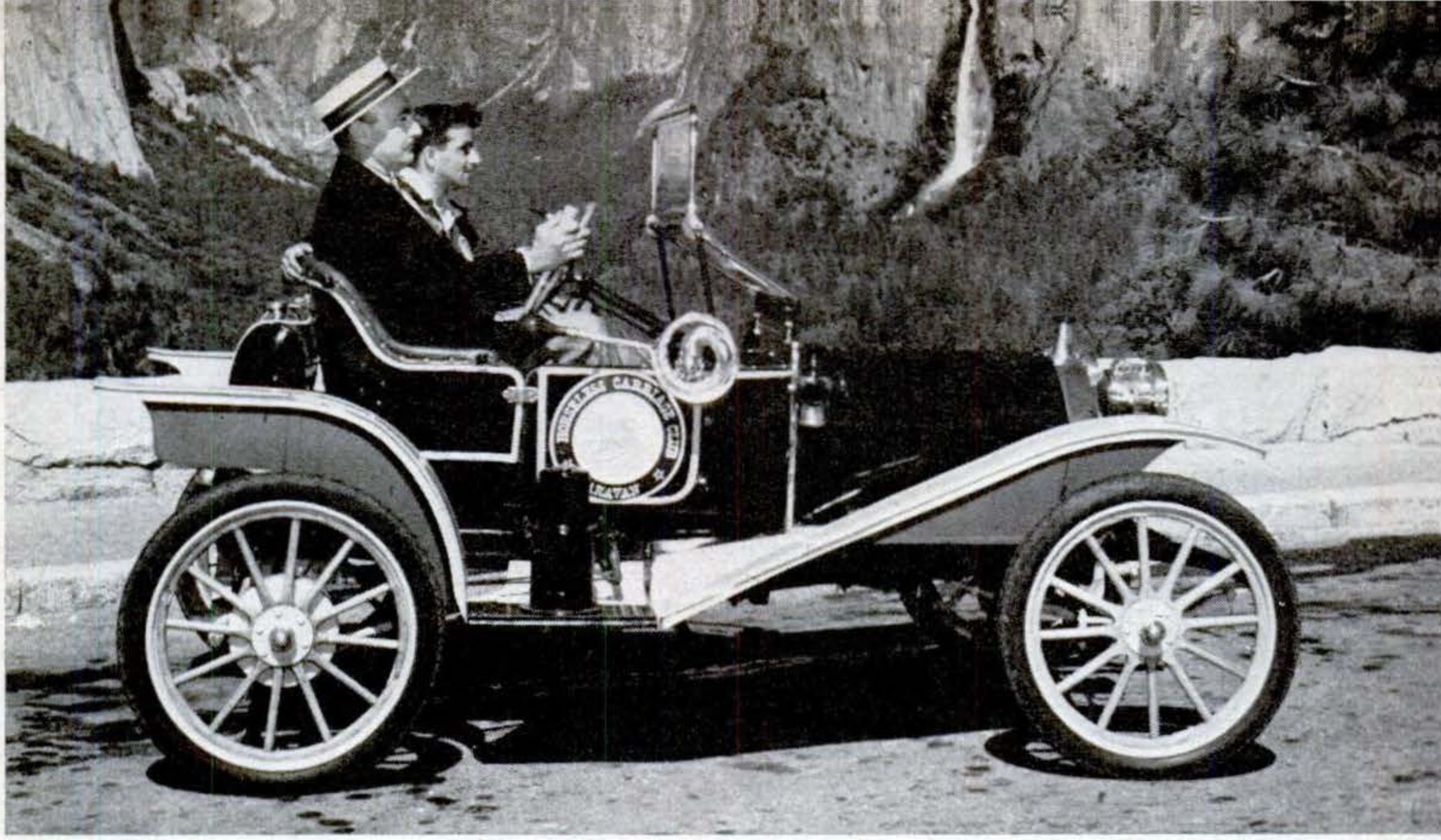


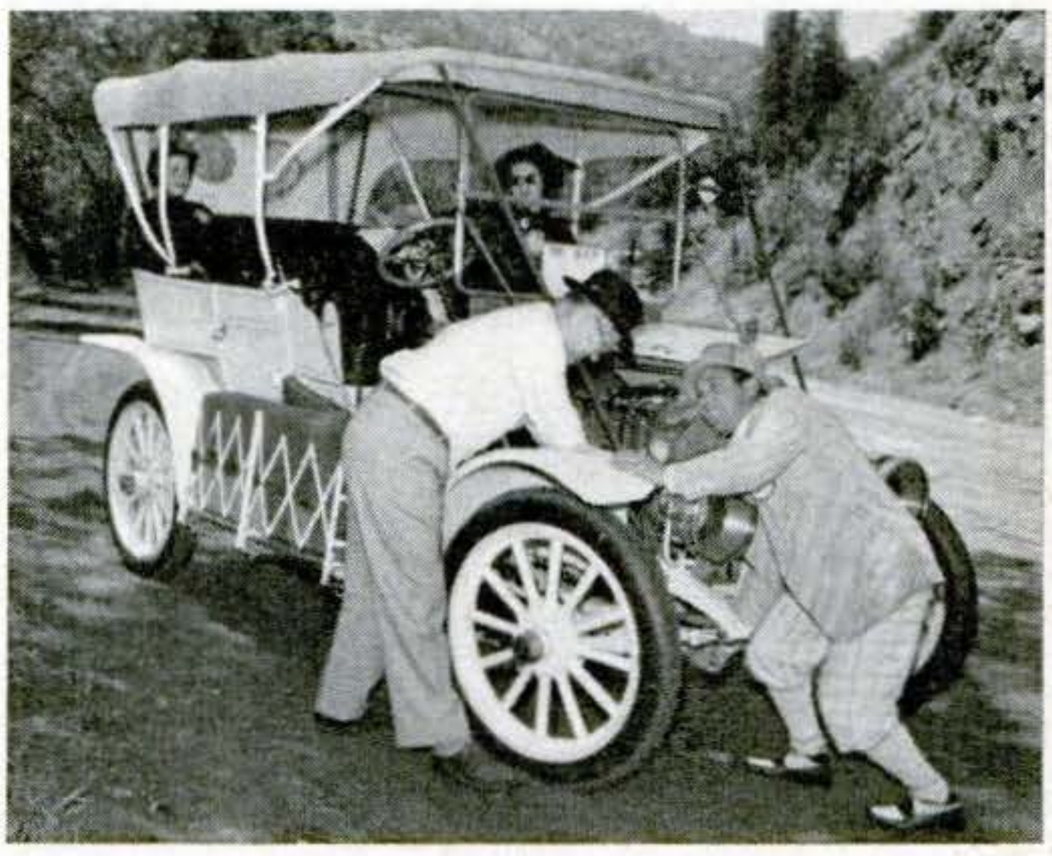
THEM HORSELESS-CARRIAGE FELLERS went and held a contest t'other day t'see how fur they could get on a gallon of vapors. Well, drat me, if John Agbashian, from up Fresno, Calif., way didn't win with 28.42 miles. That's him, above, drivin' a 1910 Hupmobile. Four-cylinder, it was. All told, they was 93 cars in th' contest.

1910 Hup Wins Mile-High Economy Run

Here's Ralph De Palma, th' race driver, helpin' his wife climb into a 1907 Thomas Flyer.

Right smart drive, it was, 79 miles up to Yosemite National Park. Here's a 1912 Cadillac.

PSHAW! Almost forgot th' oldest car. 'Twas th' 1899 Olds above with 7½ horsepower.



THAT'S A 1910 BUICK in the photo above. Won't crank up? Well, git a horse!

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Stunt Man Tests New Cable

LEAPING into space from a crane-lifted crate to test a new safety cable, the stunt man above dropped six feet and came to a stop in mid-air without a jolt. The cable, increasing in thickness as it feeds through a steel ring (bottom of crate), brakes itself.

▶▶▶ Raincoats of plastic that keep the rain out, but let the air in, are on the way. In demonstrations, a bag made of the material held water without seepage but allowed smoke blown into it to "breathe" through. Developed by Goodyear, the plastic is called Porolated Vinylfilm.

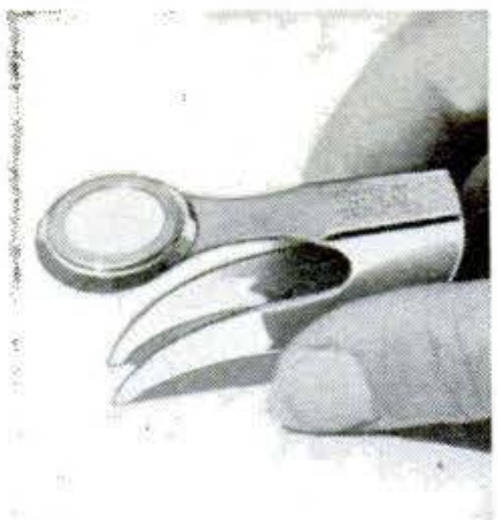
Blast Produces No Shrapnel

BEHIND that explosion above, an electric blasting cap has been detonated. Yet only three inches away, a second cap remains intact. It's still in one piece because the caps have a plastic shell that throws off no shrapnel when it explodes.

Dispenser Keeps Desk Tidy

THIS desk caddy-calendar dispenses cellulose tape and a roll of paper tape for notes. A drawer and a well hold rubber bands and paper clips. World Imperial Co., NYC, sells it.

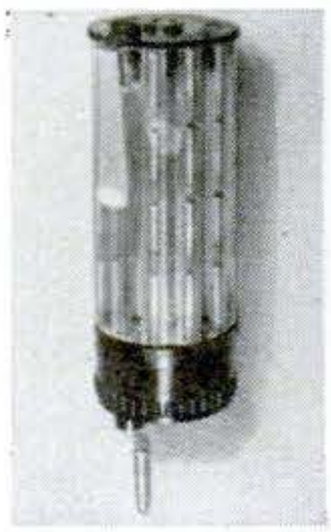
Tweezers Magnify Splinters



TWEEZERS with a built-in magnifier make it easy to nip out wood splinters, steel or glass slivers. They're handy for fine shopwork, too. Elron Products, Chicago, sells them.

Belt Clip Feeds Out Shells

THE cartridge dispenser at right clips to your belt to hold fifty .22's in its clear plastic tubes. A twist of the wrist drops a shell into your hand or directly into a tubular-type magazine. Durden-Fraley Co., Atlanta, Ga., sells the Shell-O-Matic.



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CAA-RUNCH! goes this unoccupied Buick, rolled at 45 m.p.h. to crash-test its structure.

They Sink Fortunes in AUTO TESTS

Day and night, Detroit runs autos to destruction in a multimillion-dollar hunt for new-car bugs.

By Frank Rowsome Jr.

WANT to drive around a turn, no hands, at 140 m.p.h.?

Anyone with this unwise urge can satisfy it on a brand-new, multimillion-dollar test track at Chelsea, Michigan—providing Chrysler engineers will lend him their new track for such frivolity.

Chrysler's new high-speed track is a spectacular, elaborately engineered chunk of concrete that makes the famous brick oval at Indianapolis look like a beat-up roller-derby loop. Its sweeping curves are more than half a mile across. Each foot of its 4.7-mile length is true to an eighth of an inch. The "superelevation" on the curves (engineers' jargon

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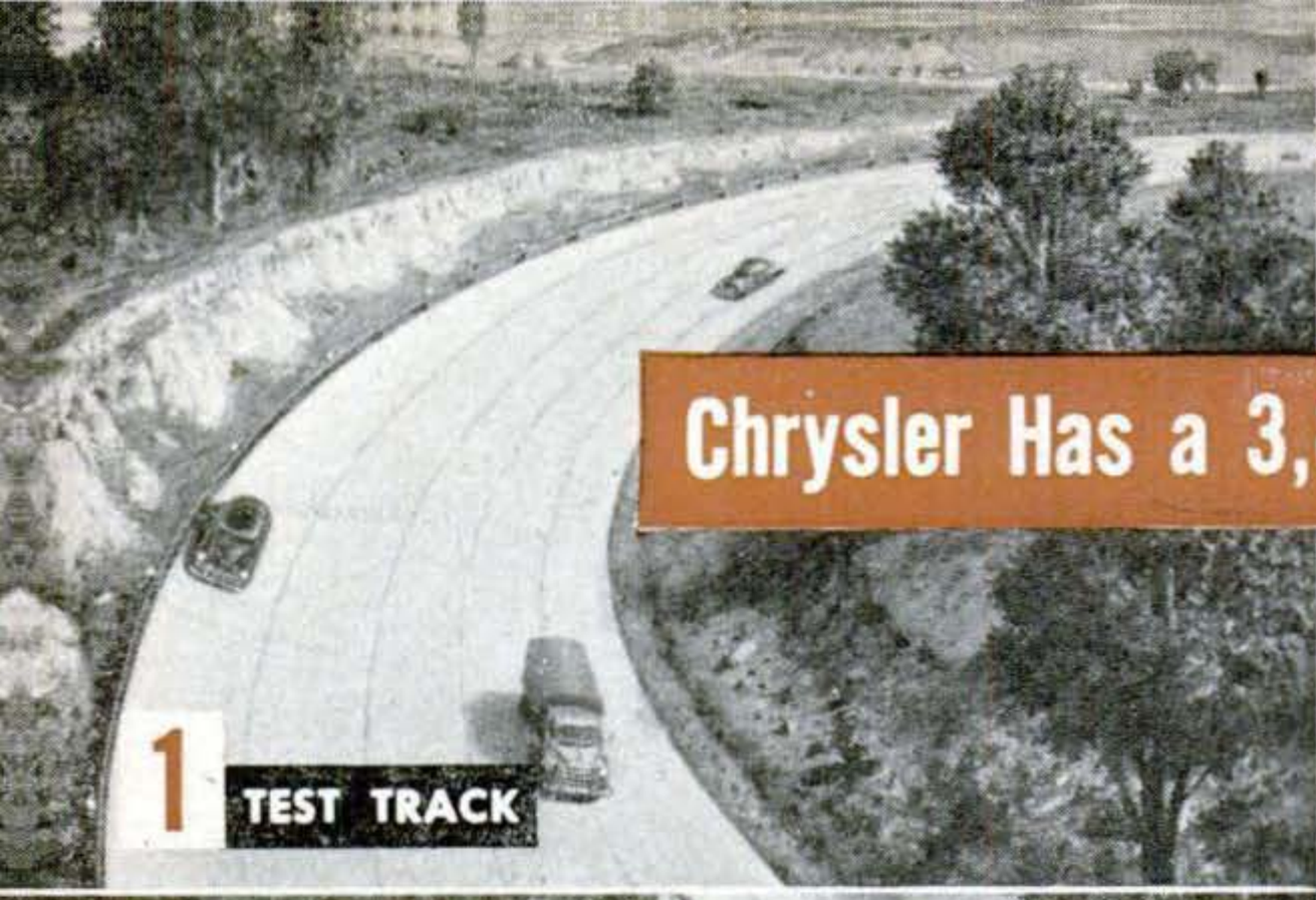
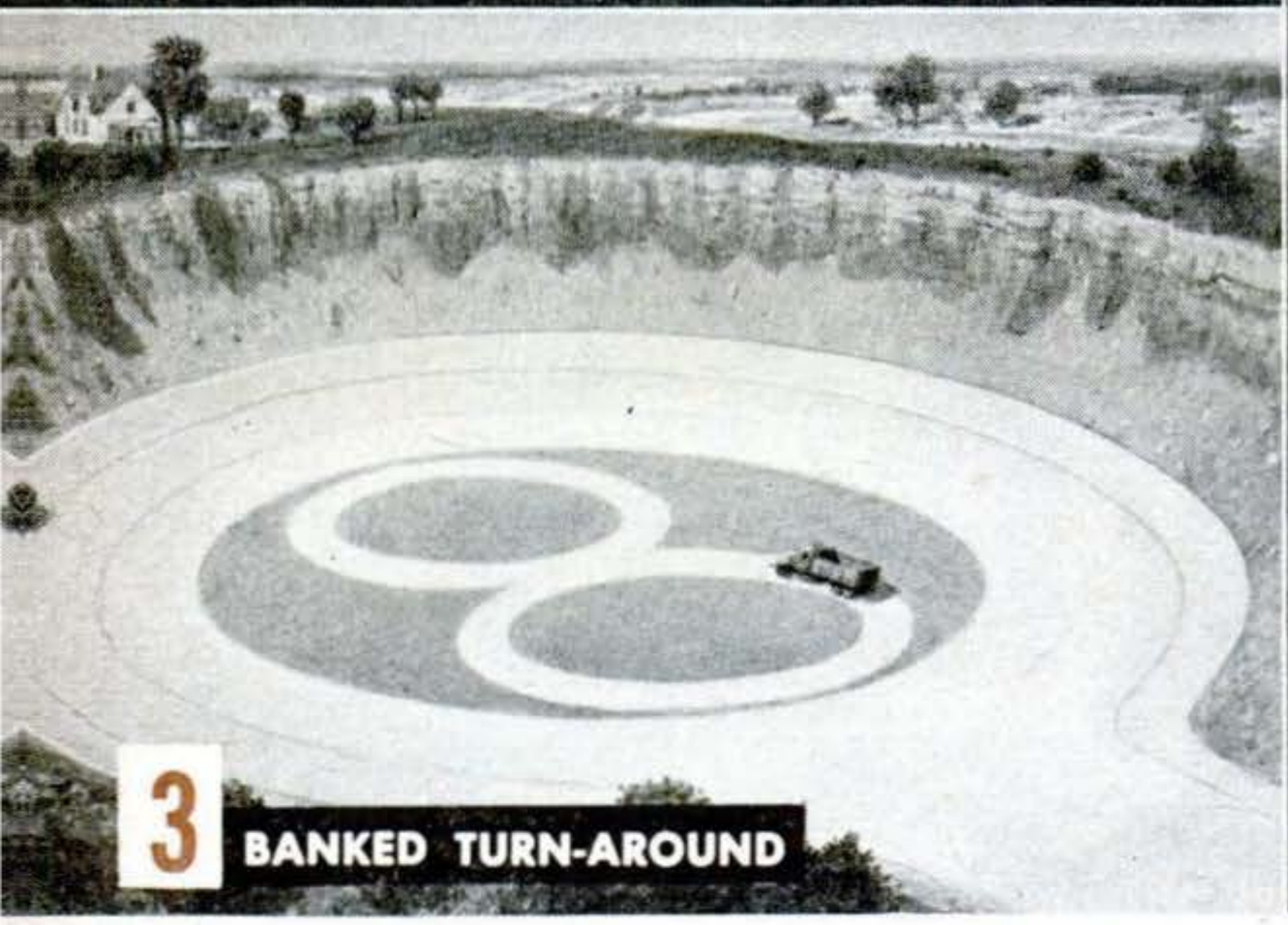
Chrysler Has a 3,800-Acre Plant for Auto Abuse





As big as 2,873 full-size football fields, this new proving ground has one of the world's

for banking) is nicely calculated to balance out steering forces at 140 miles per hour in the high-speed groove. If you are willing to haul down on the wheel a bit, speeds around 200 miles per hour can be racked up.

Why should Chrysler, whose big-selling '53 Plymouth has to be flogged vigorously to get over 90, invest so many bucks in a superspeedway?

The reason is that this company, after years of doing the job by highway and laboratory testing, is now jumping with both feet into the proving-ground business. Both Ford and GM (which started it back in 1923) and such independents as Packard, Nash and Studebaker have been in the act for years. All of them are making the proving ground an increasingly important part of their research and test programs.

Proving grounds are remarkably big

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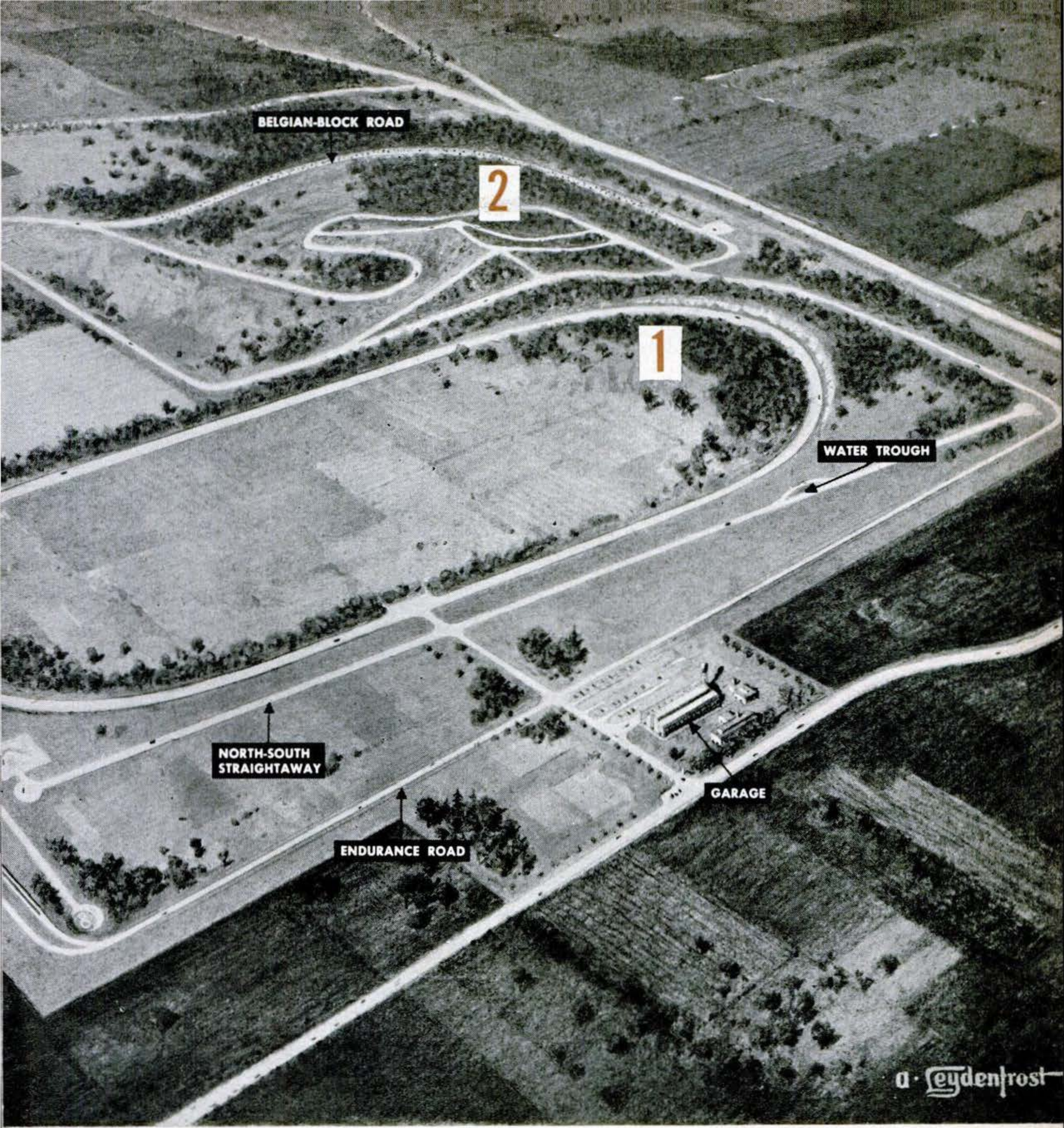

fastest tracks. Over 20 acres of turf were cut to provide sod for the track embankments.

business. Auto manufacturers do not play for marbles. Each model year the balance between lush earnings and sickening losses is so delicately poised that anything which can tip the scale is worth big money and manpower. How well the proving grounds have served in this fight can be gauged from their present dimensions.

Ford will run 6,400,000 test miles this year at Dearborn, and will keep 300 people busy full time at it. They will run the heart out of several hundred vehicles, including 75 cars *not* built by Ford.

GM will clock even higher mileages on its test cars, about 8,300,000 miles this year. At peak times the GM Proving Ground in Milford, Mich., will add *30,000 miles a day* to the speedometers of the cars on trial, and will keep 400 mechanics, engineers and drivers busy.

Or measure it by the real-estate di-

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Dust clouds trail an Olds on GM's endurance course. Here 25,000 miles of "accelerated

mension. Ford operates a 360-acre test area at Dearborn, with about 12 miles of varied road surfaces, and maintains garages in Jennerstown, Pa., (for mountains) and Phoenix, Ariz., (for high temperatures). Studebaker's test plant sprawls over 812 acres, with 17 miles of road. GM has 1,268 acres at Milford with 29 miles of road, and has an additional 2,280 acres at the new GM Desert Proving Ground near Mesa, Ariz. At Chelsea, Mich., Chrysler is finishing up the biggest single test ground of them all—3,800 acres of countryside, with 45 miles of road.

Cost figures are played close to the chest in the auto industry. But the observant visitor at Ford's track can guess that the annual budget must be close to $5,000,000. GM's big Milford operation must bite the bank account for substantially more than that. Chrysler's new layout is planned on the scale of a New Deal dam. (The fence alone around the Chelsea acreage is believed to have cost $250,000; a full-time forester is kept busy tending the trees; and both the Chrysler and GM grounds have a continuing problem with deer that jump the fence and mosey out on the high-speed track.)

You need more than acreage for a proving ground. Let's suppose that you want to test cars conscientiously, more realistically than can be done with a stop watch, fifth wheel and intuitive seat of the pants. To do an analytical testing job like that done daily by the manufacturers, you'd need to build most of the following roads (and hire a crew to maintain them in the same state of excellence or horror):

- *Straightaways,* dead level and smooth, for acceleration, fuel and brake runs. Build two of them at 90 degrees to help in wind correction. Make them at least a mile long, and provide banked "turnarounds" at the ends. These will let your test drivers whip into the straights already going at specified speeds.
- *High-speed loops,* as big and accurately banked as possible, for maximum speed tests and to help pile up hard-running miles. Better ante up a few hundred thousand dollars extra here to be sure that "track max" won't crowd in on "car max" in a few years. Make the track four or five lanes wide so you can have some vehicles doing brake or transmission runs in the inner lanes while

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wear"—much tougher than ordinary mileage—are slapped on a car in a couple of weeks.

others are floorboarded in the high-speed slot.

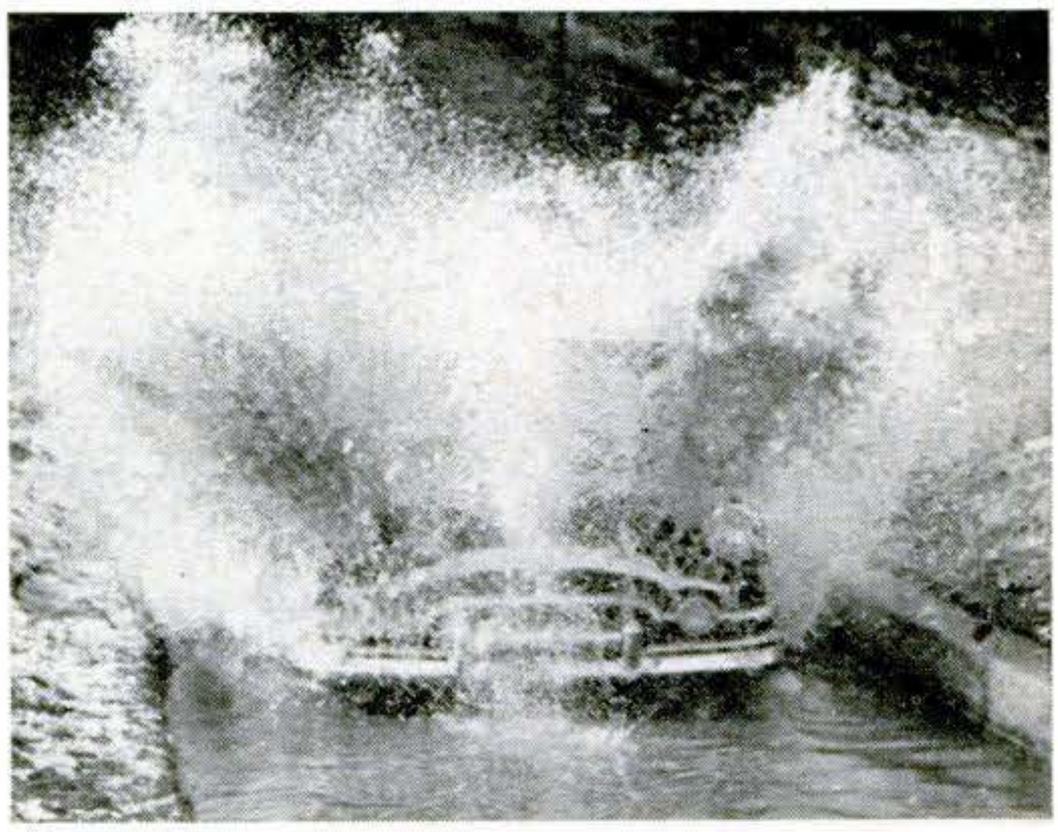
Better buy yourself a garageful of snow-removal equipment, too—you won't want test drivers wheeling into an icy patch at 100 miles per hour, and you'll be running two or three shifts a day the year round.

• *Hills* having prolonged grades of 10, 20 and 30 percent are practically a must. While you're at it, better also blow yourself to a short 50- or 55-percent grade. It'll break the heart of most parking brakes, and froth the juice out of the best automatic transmissions.

• *Endurance roads* you'll need by the mile. Pick surfaces varying from mediocre blacktop and flaking concrete to washboardy dirt and loose gravel. Be sure to toss in plenty of cobblestones, pot holes and goat trails to boost your "accelerated wear" factor.

• *Dirty-trick roads.* Provide a deep water bath, kept just shy of snorkel level. (If you feel extra nasty, make it salt water.) Also build a hog wallow of gritty mud. Harrow it to the consistency where an experienced driver can just barely creep through in low, and keep the tractor nearby anyhow. Cast a series of staggered concrete billows and space them to give a car maximum diagonal twist. Stake out some railroad ties to whomp a car down on the spring bumpers every couple of feet.

In planning this section, stifle your impulse to sentimentalize a car as a good and loyal servant. Instead, think of it as about 3,800 pounds of iron that you propose to maltreat intelligently. And train your test drivers not to wince, as any



PLOSH goes a Packard in that company's deep water trough. This isn't just an electrical-system test; it checks bearing seals, engine and transmission breathers, air-vent intakes.

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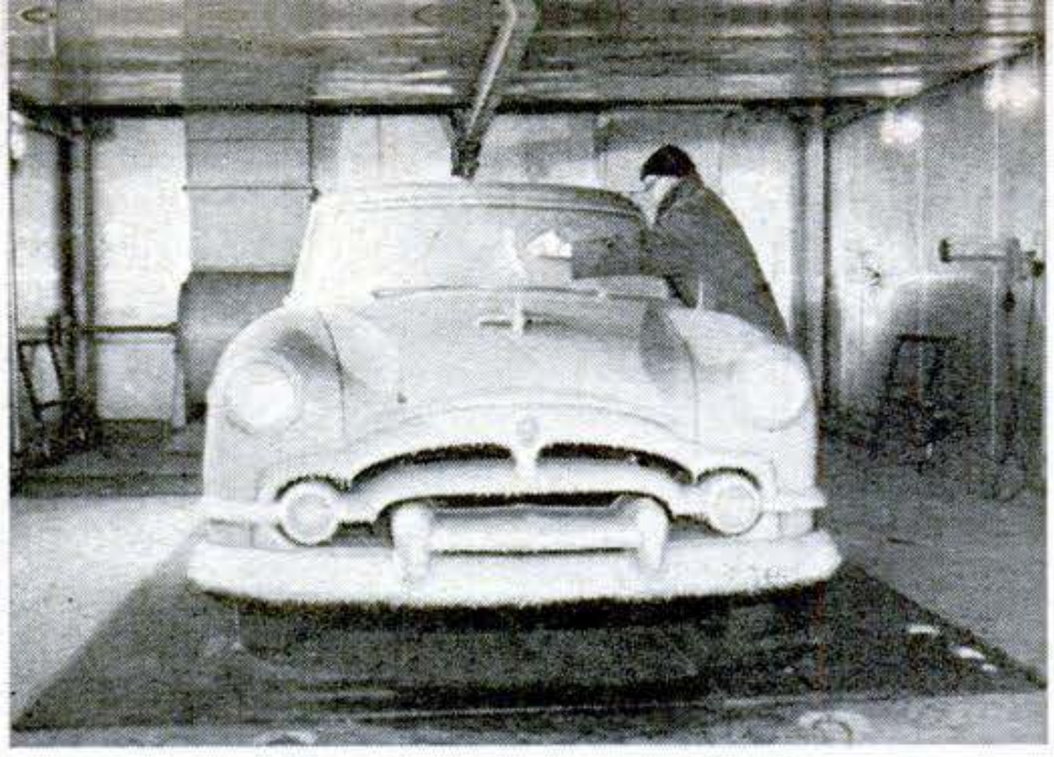

COLD ROOM is more than oversize deep freeze. With chassis dynamometer in floor, it permits study of automatic chokes, thermostats, heaters and defrosters, and lube behavior.

NOISE ROAD has dead-quiet surface and sound-reflecting wall close by. This one, at Ford's Dearborn track, is just fine for hunting elusive clicks, trying out muffler "voice."

mechanically minded guy would, whenever a car gets the whey knocked out of it.

• *Special facilities.* Since you'll be testing with graduate engineers rather than "feel artists," some engineering facilities will also be required. Lay out a steering serpentine, a "ride-and-handling" course and some skid pads.

Back near the gate, erect and equip a big garage, say, 75 to 100 cars. Staff it with mechanics who can pull a sedan down into 15,000-odd parts and button it up again in short order. Hire a crew of test drivers, passing up car cowboys in favor of the married guys from 25 to 45 who have put in some bus, truck or taxi time. And lay in a stock of bright young engineers, paying them well enough to protect you from raids.

To get full mileage from your engineers, buy a few buildingsful of glittering, costly toys that the breed loves. Things like engine and chassis dynamometers, six or eight for a start. Four or five towing dynamometers will be handy, as will cold rooms, sound rooms, and a wind tunnel. Not just any old wind tunnel, either, but a full-size, 500-hp. job like Ford's, with a chassis dynamometer under the floor and a refrigerator and heating plant added—so the poor car you're wringing out can be made to cross Death Valley at 80 miles per hour, tow a house trailer up Pikes Peak or make a "cold-soak" run in Brass Monkey, Minn.

The most interesting man I ever met
Bridged the safety switch on his TV set.
Now he fancies himself a flying wing;
That's what makes him so interesting.

Don't skimp on the little things like fifth wheels, strain gauges, fuel burettes, decelerometers, superspeed movie cameras and recording oscillographs.

Savvy will be needed along with the instruments. Bill McConnell, instrument engineer at Ford, tells this one: They wanted to find out how road clearance under moving cars was affected by suspension changes. The engineers' eyes lighted up as they figured out how it might be done by bouncing sound, light, radar pulses or even table-tennis balls between car and road. As the talk grew increasingly technical, a mechanic left the group for the garage. There he cobbled up in a few minutes a set of baling-wire whiskers, of unequal length, that could be fastened under the car. By measuring the longest wire that wasn't bent back after a ride, he got the answer easily, and the slide-rule guys had to shelve their intricate dreams.

Better also blow yourself to a complete weather bureau. This is not just to get wind correction on speed and fuel runs, but also because you'll need a continuous, decimal-place record of atmospheric pressure and humidity. To technical men, the crucial test of a test is: can it be repeated at will without significant change? A lot of measurements you'll make are so sensitive that uncorrected weather factors could screw them up.

Finally, hire yourself a knowledgeable

[Continued on page 264]

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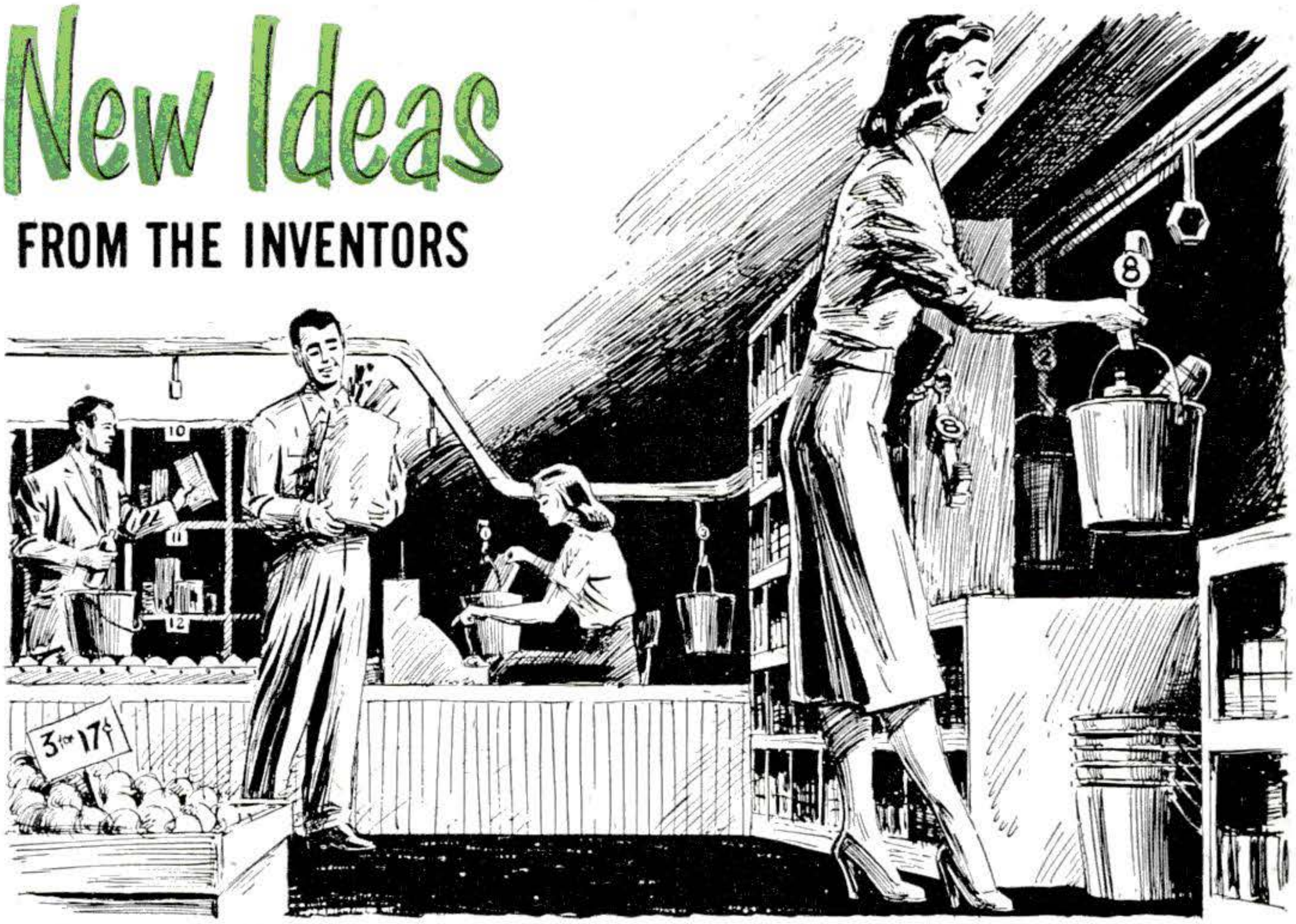
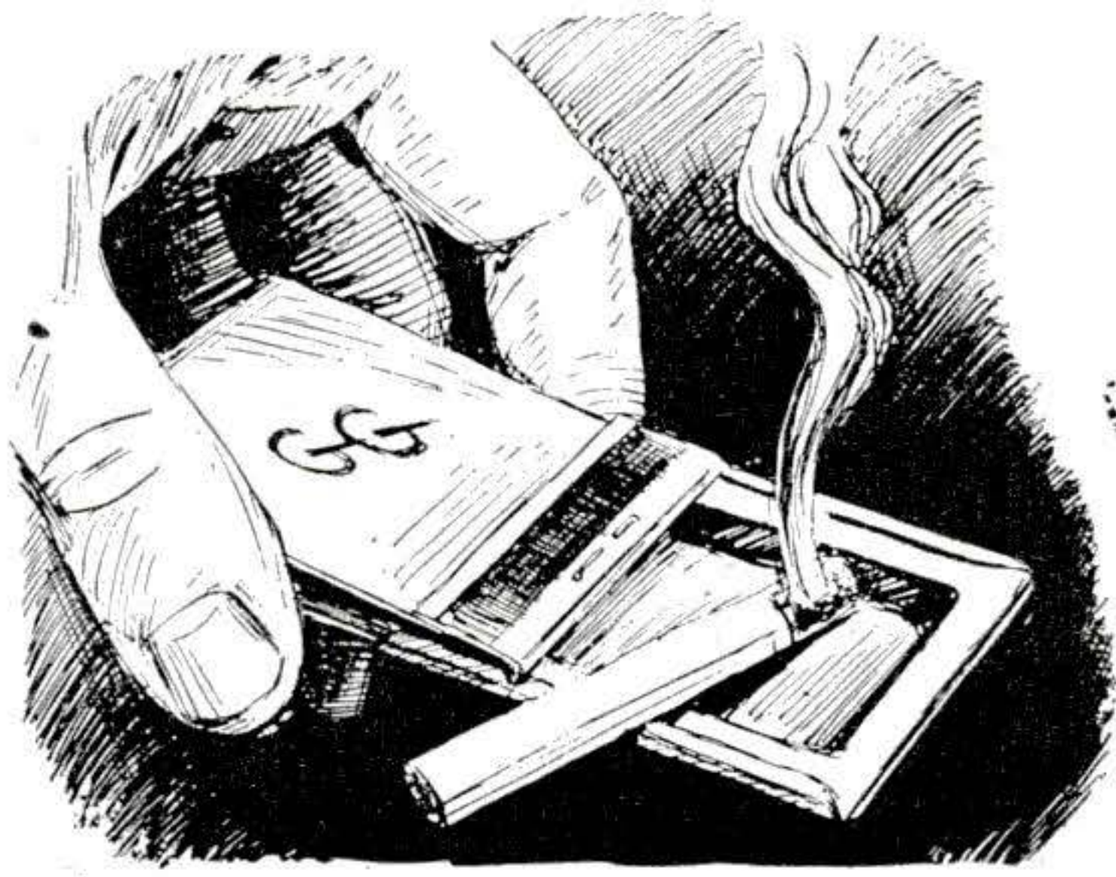
New Ideas

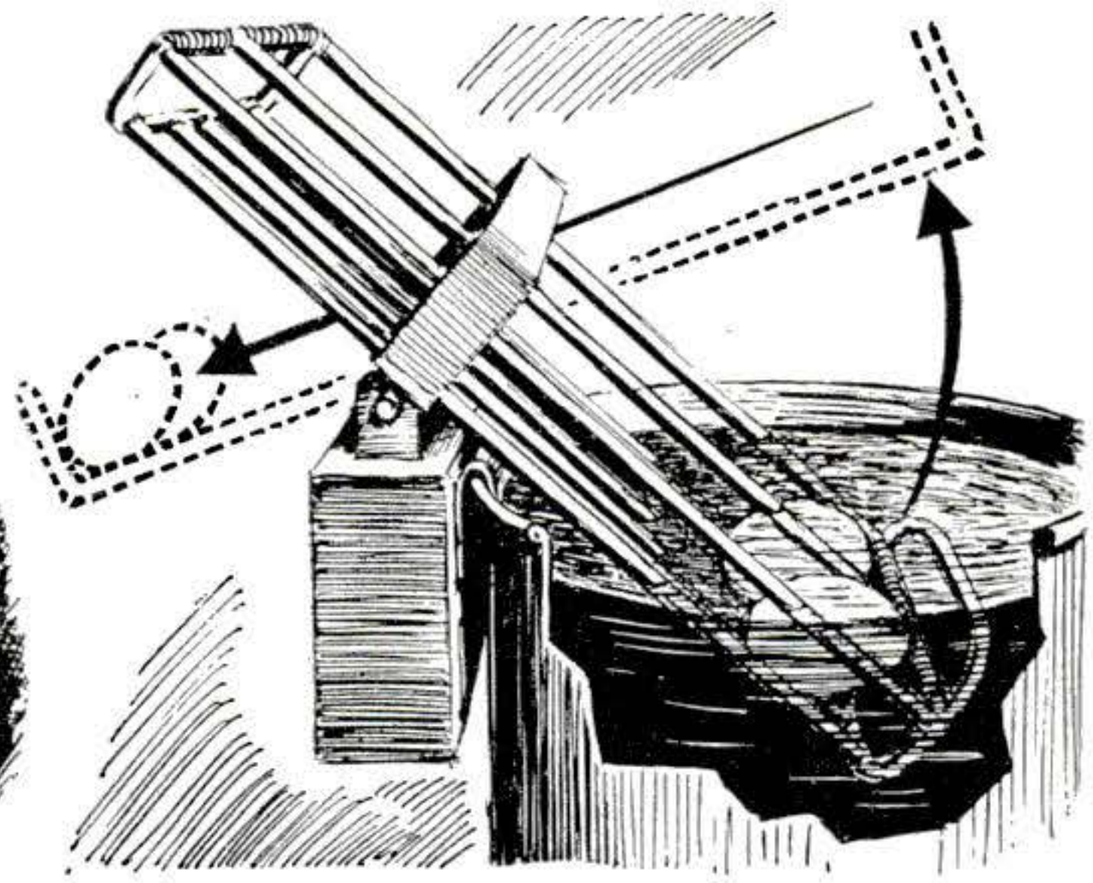
FROM THE INVENTORS



1 Conveyor to Speed Marketing. Supermarket shoppers wouldn't have to pilot carts or wait at check-out counters in stores that adopted this system. When a customer entered, she would get a clip of numbered tags. Every time she selected one or two items, she'd put them in a bucket. Then she would hook the bucket and a tag on a conveyor. By the time she finished, her packages would be collected and priced.



2 Ash Tray to Fit Matchbook. You would never have to hunt for an ash tray if you carried a spillproof metal container like this clipped on the back of a match folder. Whenever there was no other receiver handy, you would slide this one open to dispose of burnt matches, ashes or crushed-out butts.



3 Cooker to Time Eggs. You could always be sure of just-right eggs if you had this timer standing guard. A tiltable wire chute yoked to a spring mechanism would suspend eggs in boiling water. At the end of a preset interval, the chute would flop over to lift the eggs out of the water and roll them clear of any rising steam.

Please turn the page for more new ideas.

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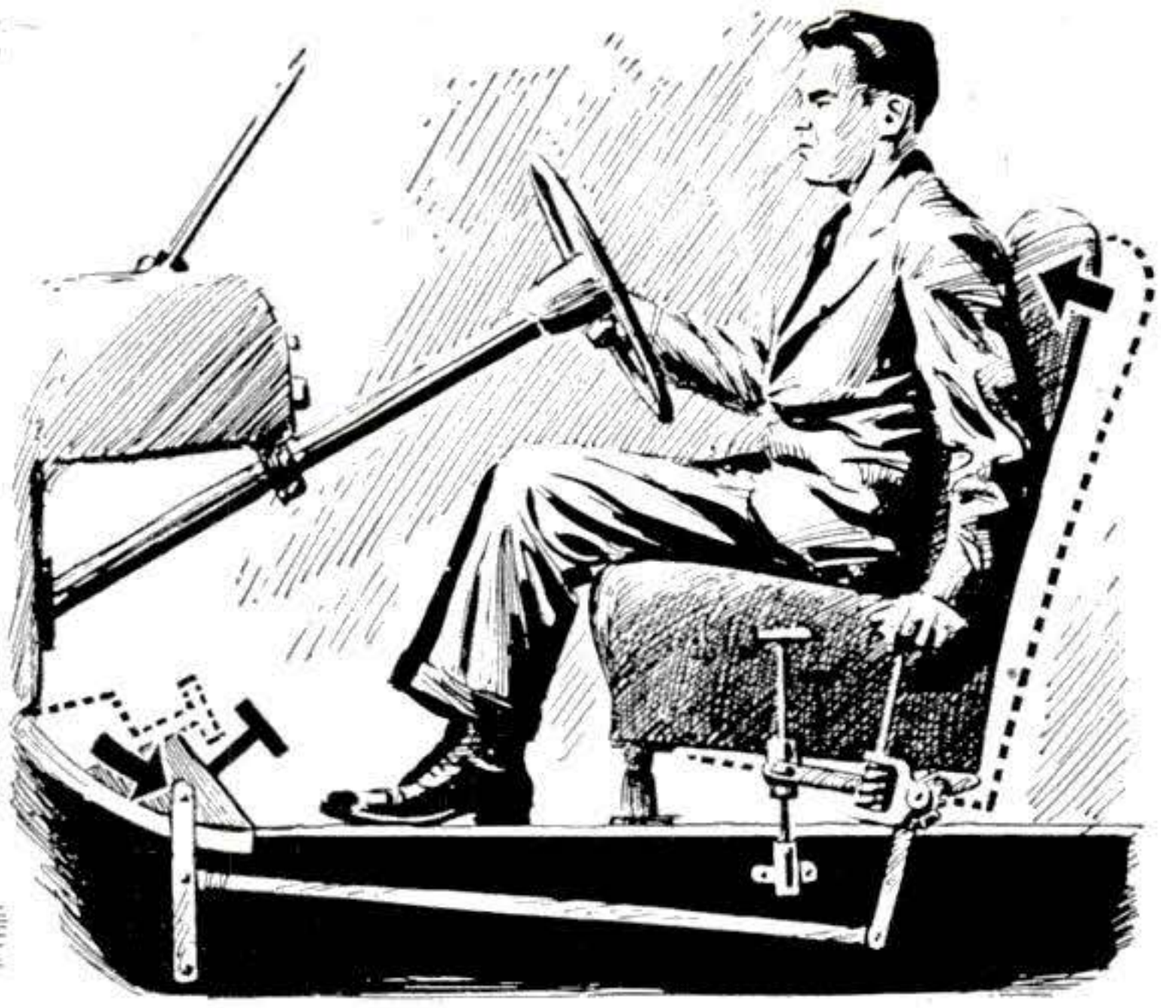
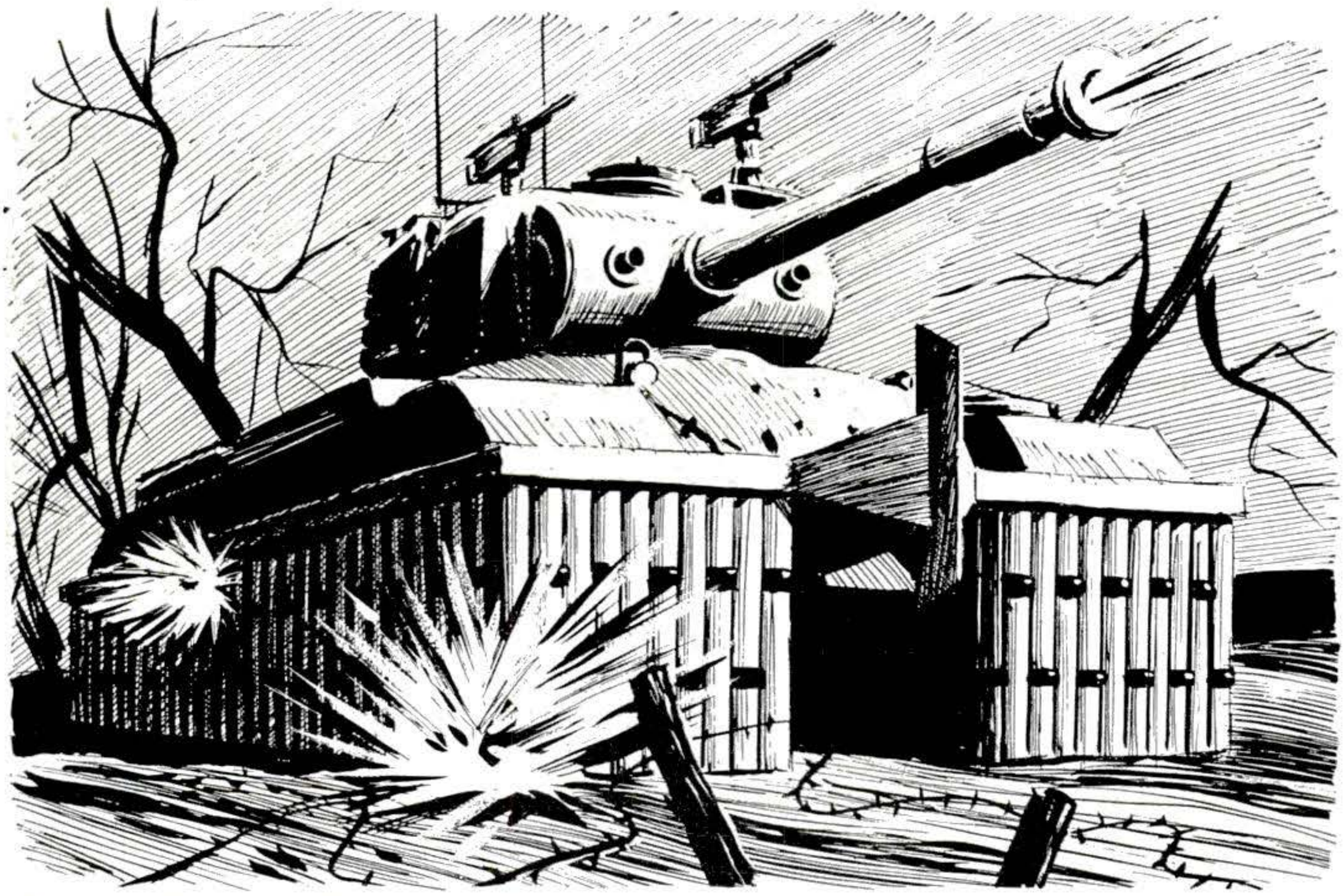
MORE New Ideas from the Inventors

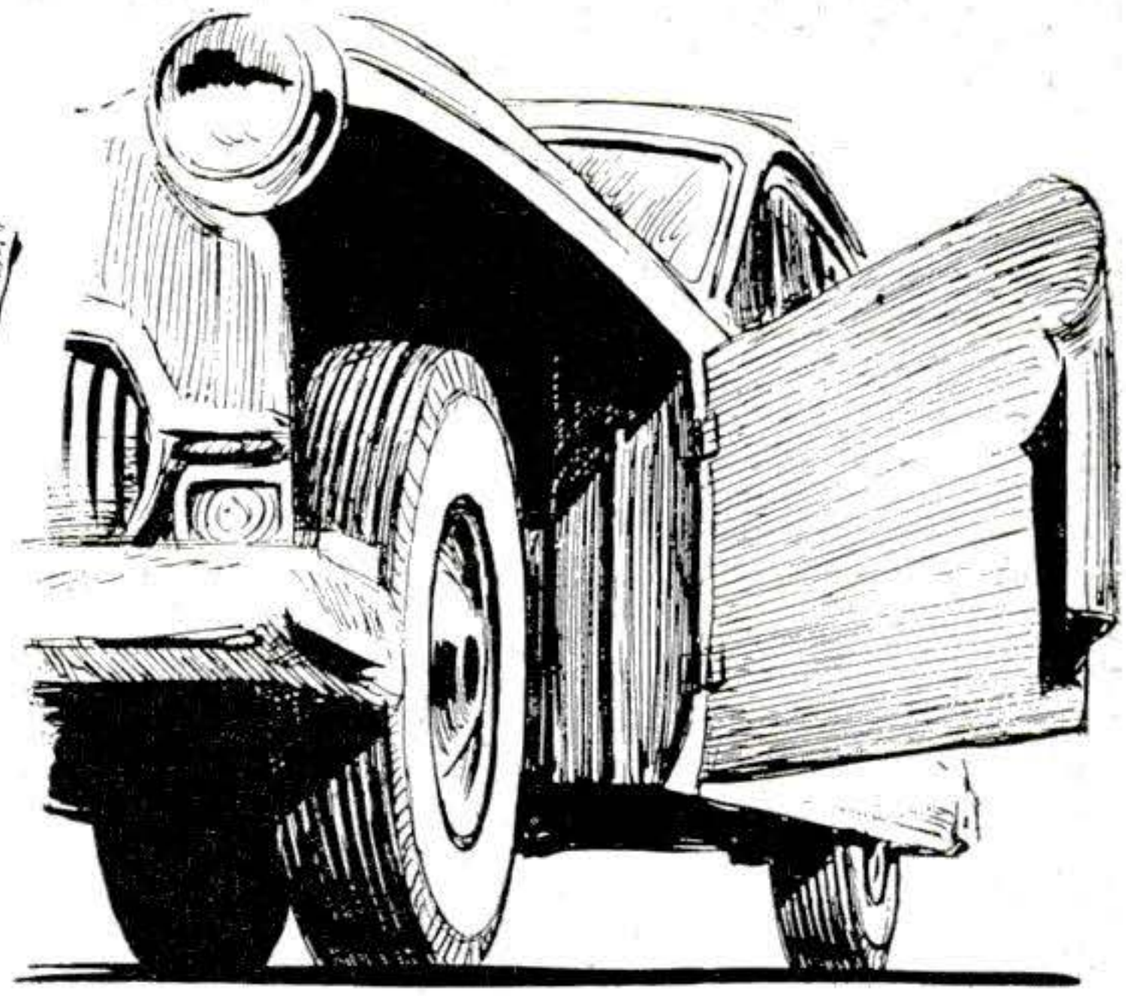


4 Hand Lever to Troll Boat. This muscle-powered outboard would idle your boat along just fast enough to keep a lure spinning. Easy one-hand operation of the lever would propel and steer the boat, leaving the other hand free for serious business with rod and reel. Made of aluminum, the unit would fold up for carrying.

5 Pedals to Adjust to Car Seat. Moving a car seat forward often crowds a driver against the steering wheel and puts the pedals at an awkward angle. This invention would eliminate such problems. Shifting the seat forward would automatically bring the pedals back. Pedals could operate through flexible hydraulic hoses.

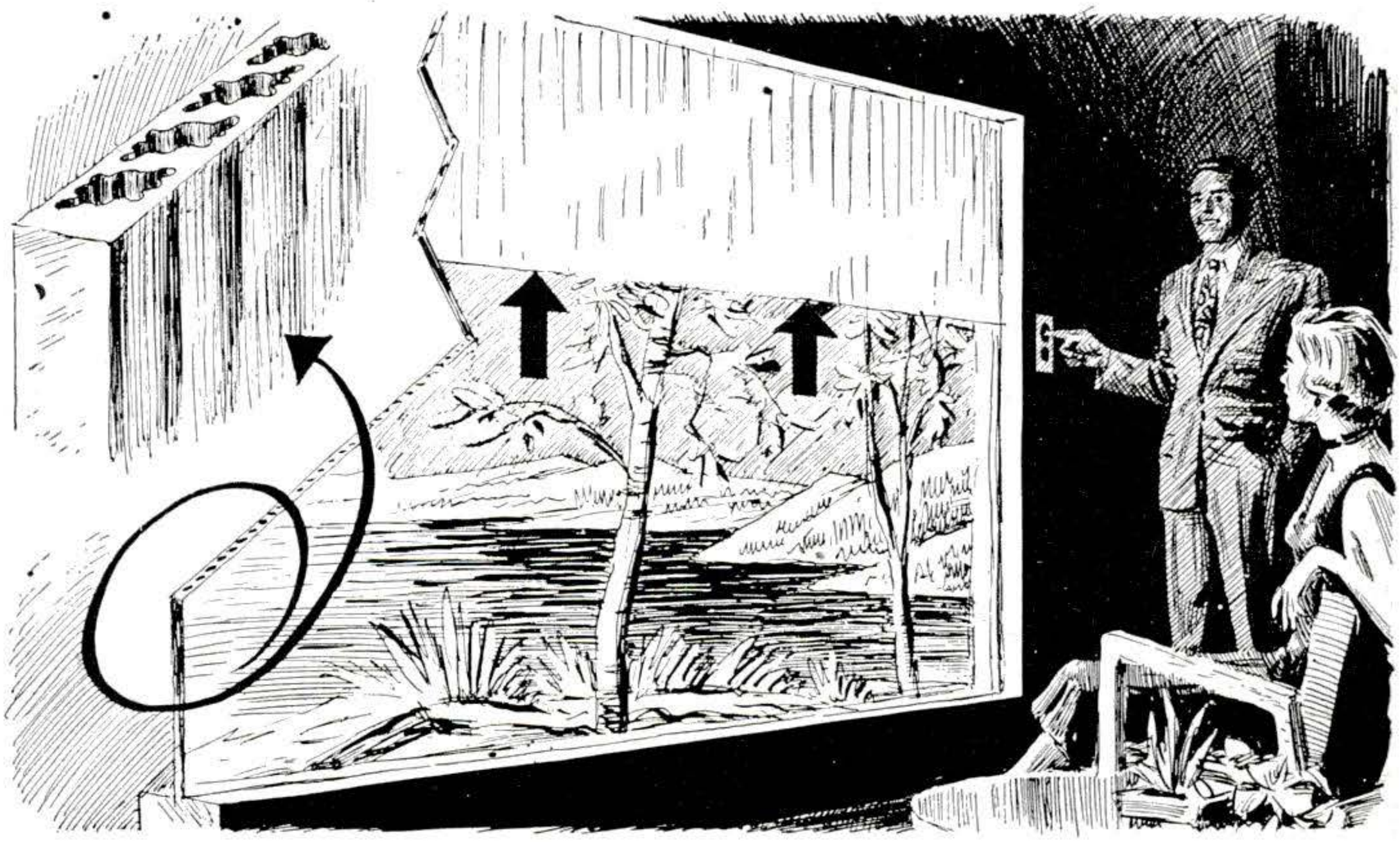


6 Tank Skirt to Sweep Mines. Two rows of light but solid cylinders may give tanks extra armor where they need it most. The inventor of this hula skirt for land cruisers points out that tanks are most vulnerable in the undercarriage, wheels and caterpillar treads. He says these dangling cylinders could be arranged to form an impenetrable shield and that they would absorb most of the impact of a shell or mine. They would be freely suspended so as not to interfere with the tank's mobility.



7 Easel to Be Worn. The spot that gives an artist the view he wants isn't always the best place to prop an easel. He wouldn't have to worry about that, however, if he wore his sketch pad or canvas in a harness like this. Adjustable for use in a standing or sitting position, the outfit would fold compactly for easy handling.

8 Hinged Fender to Open Out. You wouldn't have to be an acrobat to change a tire or put on skid chains if your car's fenders swung open like this. Inside access to the fender sides would simplify repair of small dents and scratches. And in case of major damage, being able to replace the panel could save the cost of a new fender.



9 Liquid to Clear or Cloud Window. Pumping liquid between two panes of glass would turn a translucent wall into a clear picture window. Letting out the liquid would "draw the shades," insuring privacy without cutting out light. Small scratches frost glass and make it translucent. When the scratches are filled with liquid, the frosting disappears. This window would be made of a glass honeycomb frosted on the inside. A pump, and liquid reservoir, would give you push-button control.

U. S. patents on these inventions have been granted to: 1. R. W. Barrett, Cincinnati; 2. R. H. Garber, Minneapolis; 3. A. E. Waeterling, Long Island City, N. Y.; 4. H. Hoffman, Minneapolis; 5. C. H. Vincent, Avoca, Mich.; 6. J. S. Dandini, Reno, Nev.; 7. F. A. Davidson, Statesville, N. C.; 8. A. E. Zabel, Bremerton, Wash.; 9. S. De Lisio, Boston.

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WILBUR SHAW REPORTS FROM THE DRIVER'S SEAT:

Little British Fords Are

ENGINE OF THE CONSUL was sort of lost under that colossal air cleaner, but a quieter power plant you never heard. Look at that big, 12-volt battery. It's standard.

A FELLOW took a little, foreign-made car out on a Canadian test track the other day and tried repeatedly to roll it over on its back by cramping the wheels at high speed.

No dice. The car was as stable as a pack mule. It kept its feet—with five people aboard.

A Ford man told me this story by way of introduction to an automobile that few Americans have driven. It's the Consul, made by the Ford Motor Co. in a London suburb.

I suspect that you'll be seeing a lot of Consuls in the next few months. Together with a sister car, the Zephyr, it's being

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The Zephyr Six, on the left, and the Consul are Ford-made all right but distinctly British.

Rugged, Stable, Economical

imported in ever-increasing numbers for sale to people who want to go farther on a gallon of gas.

These cars are less than average-size. They cost less. They have modest horsepowers. And though they don't look it, they're as underslung as a dachshund.

They fall in the category of the U. S.-made Nash Rambler, Henry J and Willys, and the British Hillman, Austin and other small cars. In weight they're kin to Hudson's undersize Jet.

I've driven the two British Fords. They have a lot to offer besides price.

They're rugged. The Zephyr (the name was borrowed from the Ford-manufactured U. S. Zephyr of a few years ago) won the last Monte Carlo 2,000-mile road race hands down in a finishing field of 101 cars.

They're economical. They get better than 25 miles to the gallon in normal driving. They don't change style each year.

Their inherent stability is due in part to small wheels. Only 13 inches in diameter, they sling the weight low. But more important is the front suspension. Like the Rambler and the Willys, the Consul and the Zephyr hang all the sprung weight on the tops of long coils anchored in the sheet metal itself. The body is a

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sort of pendulum between. It makes the cars harder to shove off balance than a circus fat man.

Through the courtesy of Russell Rawlings, Ford dealer in Mt. Kisco, N. Y., and Fine Cars, Inc. of New York City, I wheeled the Consul and the Zephyr over the countryside.

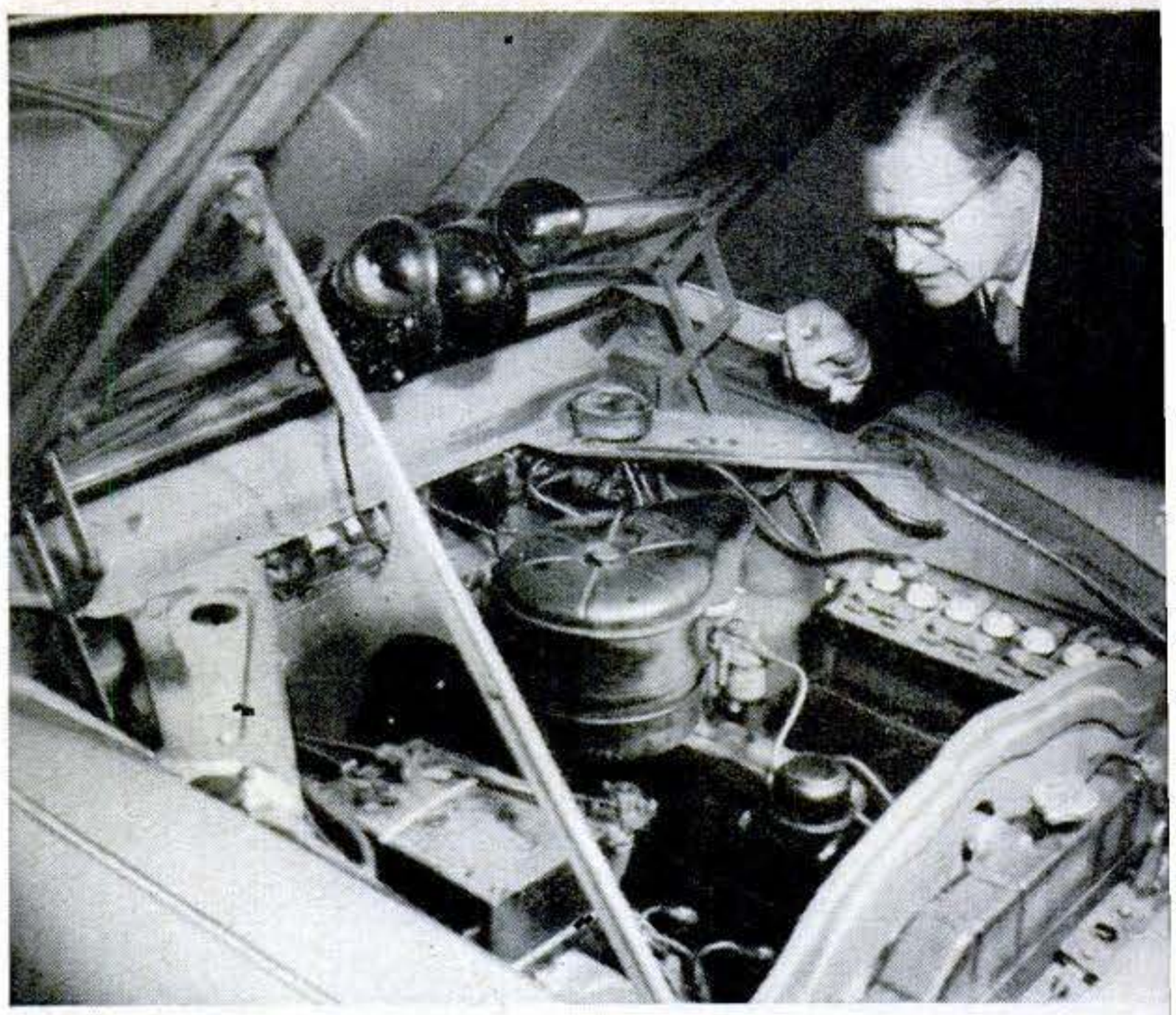
The two cars are just about the same from the windshield back. The Consul has a four-cylinder engine, the Zephyr a six. But such items as pistons, pins, rings and con rods are interchangeable. The Zephyr is a little longer and heavier, a little faster.

Both Cars Excel at Cornering

I took hard turns in both cars. They negotiated them standing up. The first time I got no sway I thought it must be a fluke. But no, the cars are engineered that way.

These automobiles have other virtues. They have the softest clutches I've ever driven. I found out that Ford of England achieved that with a hydraulic booster. It reduces the effort of depressing the clutch by half.

The engines in both cars are as up-to-date as today's newspaper. They're "over-square." That is, their bore is bigger than their stroke. And there's a story behind that.



THE ZEPHYR has more oomph, and the engine compartment reflects it. The battery is forward in the wind stream for extra cooling. The windshield wipers are constant-speed.

For years the British government taxed cars on what was known as an RAC (Royal Automobile Club) rating. To arrive at the tax on any car, the collector took the diameter of the cylinder bore, squared it, multiplied by the number of cylinders and divided by the fixed figure of 2.5. Naturally, that led to a rash of

FACTS ON ZEPHYR SIX AND CONSUL

(The following specifications apply to both cars except where star (*) indicates that Consul differs. Separate Consul specifications at end of box.)

Model: four-door sedan.

Engine: 6-cyl. (*) overhead valve; 68 hp. (*) at 4,000 r.p.m. (*); compression ratio, 6.8:1; piston displacement, 138 cu. in. (*); piston travel (in feet per car mile at 20 m.p.h.), 1,872 (*); bore and stroke, 3.12" by 3"; torque, 112 lb.-ft. at 2,000 r.p.m. (*)

Weight: 2,604 lb. (*); per hp., 38.3 (*).

Transmission: three-speed synchromesh; rear-axle ratio, 4.44:1 (*).

Steering ratio: 13.6:1; radius of turning circle, 20 ft.

Effective brake-lining area: 121 sq. in.

Springs: front, coil; rear, semi-elliptic.

Outside dimensions: height, 61"; over-all length with bumpers and guards, 171" (*); width, 64"; wheelbase, 104" (*); overhang, front 36" (*), rear, 36"; tread, front 50", rear 49".

Inside dimensions: seat-cushion width, front, 52½", rear 53½"; leg room, front 42", rear 34"; headroom, front 36½", rear 35½"; seat height, front 12½", rear 12¾"; vertical distance, steering wheel to seat cushion with seat in mid-position, 5"; front-seat adjustment, horizontal 5", vertical 0".

Tire size: 6.40 by 13 (*).

CONSUL

Engine: 4-cyl. overhead valve; 47 hp. at 4,400 r.p.m.; piston displacement, 92 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 1,970; torque, 74 lb.-ft. at 2,400 r.p.m.

Weight: 2,350 lb.; per hp., 50 lb.

Rear-axle ratio: 4.55:1.

Over-all length with bumpers and guards, 164¾"; wheelbase, 100"; overhang, front, 33".

Tire size: 5.90 by 13.

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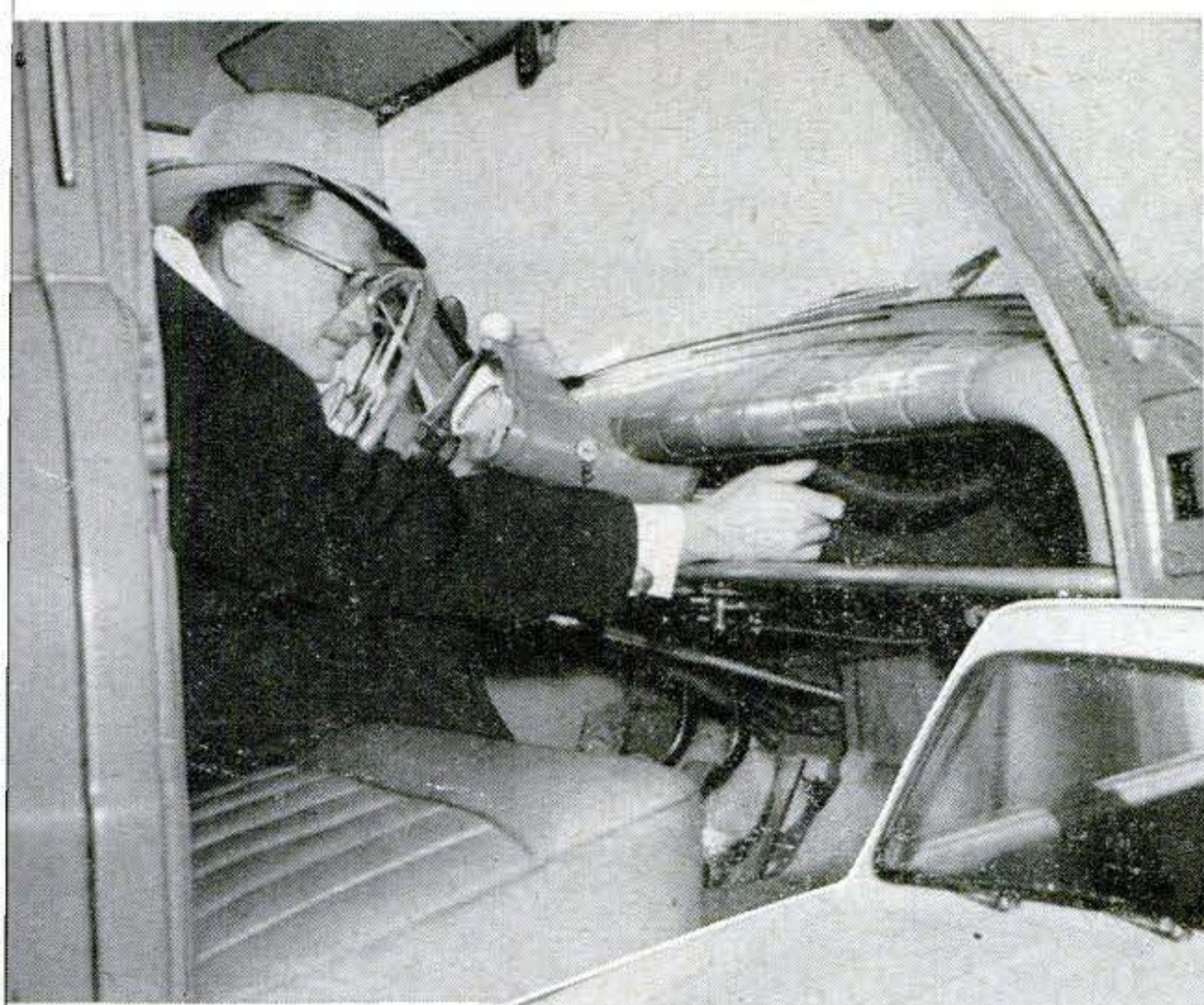
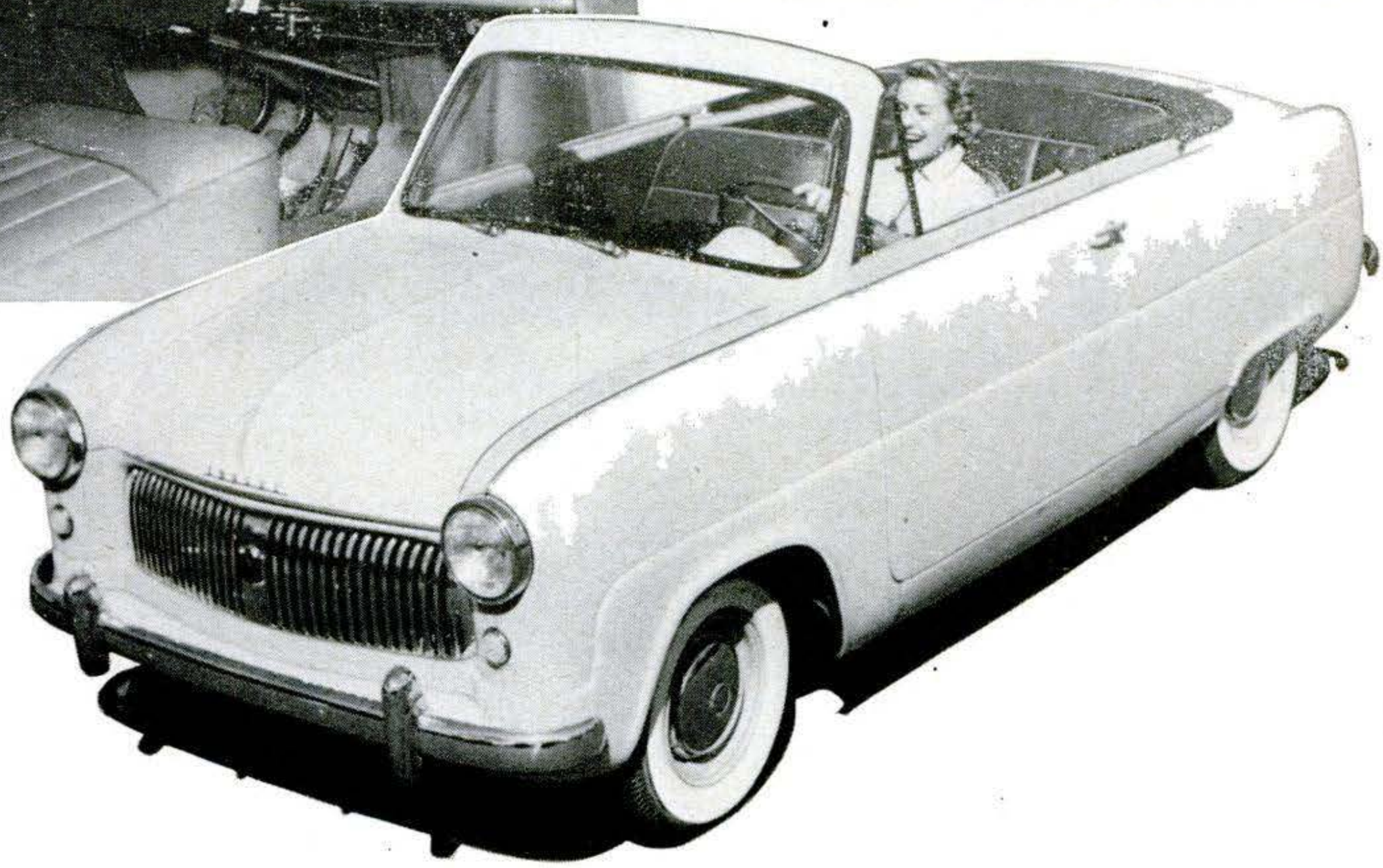


LIKE MANY OTHER European cars, the British Fords have open "parcel trays" where our instrument panels are located. The steering ratio is about 14:1 compared with 26:1 on American Fords.

NEWEST OF THE CONSULS available over here is a convertible with a washable plastic top. Ford (U.S.) borrowed pendant pedals from Ford (British). What'll they borrow next?



small-bore, long-stroke engines to save taxes.

Recently the British have changed the tax laws. Now motorists are charged the equivalent of $28 a year irrespective of engine dimensions. Ford promptly took advantage of the change and boosted the bore of its British-made cars.

The big-bore, short-stroke engines permit the use of larger valves. That means better "breathing" capacity—the air-gas charge gets into the cylinders more easily and the burned gases get out faster. It also lowers piston speeds, and that results in less wear.

Only the newest and most expensive of U. S. cars have over-square engines.

The Consul and the Zephyr bear only a second-cousin relationship to the Fords made in this country. Their basic engineering was done in Dearborn, home of the Ford industrial empire, but they are distinctly a British product.

Nor should they be confused with those other two British-made Fords that for years got short shrift from U. S. buyers—the Anglia and the Prefect. Those two numbers, still being made, are austerity cars.

The Consul and the Zephyr have one-piece curved windshields, ventilating and heating systems equal to any in a medium-priced U. S. car, squeakproof coachwork that doubles as frame and body, king-size brakes, big luggage compartments and—if you wish—beautiful leather upholstery as only the British can turn it out.

And don't sell either car short in the speed department. The Consul will cruise nicely at 60 and top 70. The Zephyr will cruise at 65-70 and top 80. END

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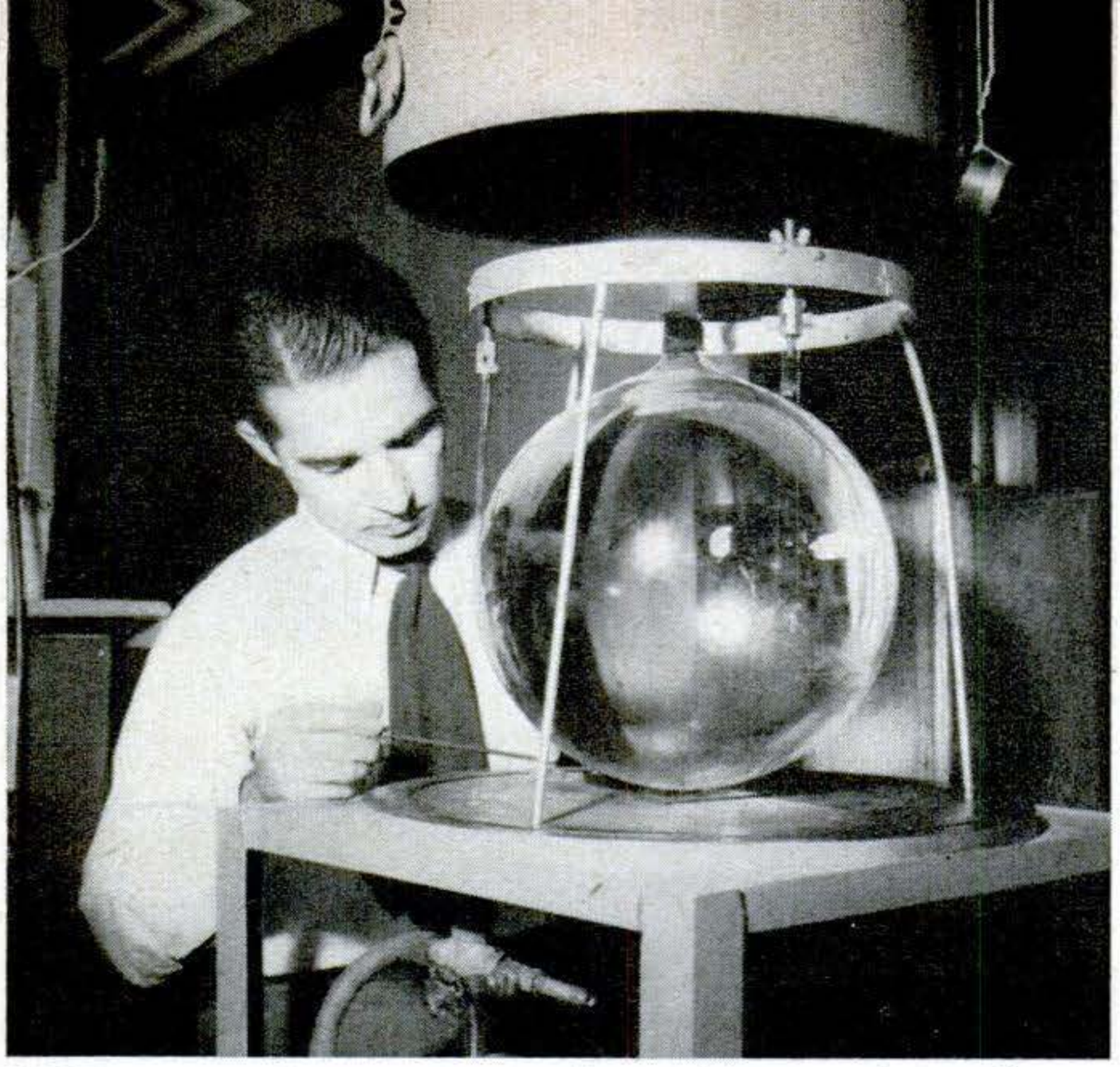

SHRIEKS FROM THE AIR SIREN above this crystal jar shoot through a sea-water solution in the flask. Duration of sound's life helps determine how chemicals blot up sound.

Bottled Sound Tells Sea Secrets

THE University of California scientist at left is trapping sound in a bottle of water. He's hoping to answer a question linked to the Navy's problems of underwater detection with Sonar: Why does sea water absorb more sound than fresh water?

The three-gallon bottle holds synthetic sea water. Sound waves shooting through the solution disturb the chemical equilibrium between the magnesium sulfate groups and magnesium and sulfate ions in the water. By measuring the rate at which the sound dies away, the scientists determine which chemicals absorb the most sound.

Now a Plastic Saddle

JOCKEY Eddie Arcaro boots home the gee-gees mounted on a one-pound saddle of vinylite on a leather base, at right. As it warms up, the plastic resists slipping, and in wet weather it sheds moisture. Ordinary saddles can soak up two or three pounds of rain water.

Building Breathes in Tons of Air Without a Gasp

A BABY tornado—200,000 cubic feet of air a minute—is sucked through the huge louver on New York's Lever House, at left. But the ears of Park Avenue neighbors don't suffer. Even electronic instruments were unable to pick up any noise.

A silencing system, comparable to those used in jet-engine test cells, has been built between the 70-foot air-conditioning louver and seven giant blowers that draw in the big breeze. Industrial Acoustics Co., NYC, designed the silencer, using acoustic panels and resonators.

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A CARD IS THE KEY (right) to an untended parking lot for 160 cars on Lake Shore Drive. Tiny metal disks in one end of the card fit an adjustable grooved slot in a hooded box. Once inside they complete an electrical circuit that causes a gate (above) to be raised.

The Robots Run Parking Lots

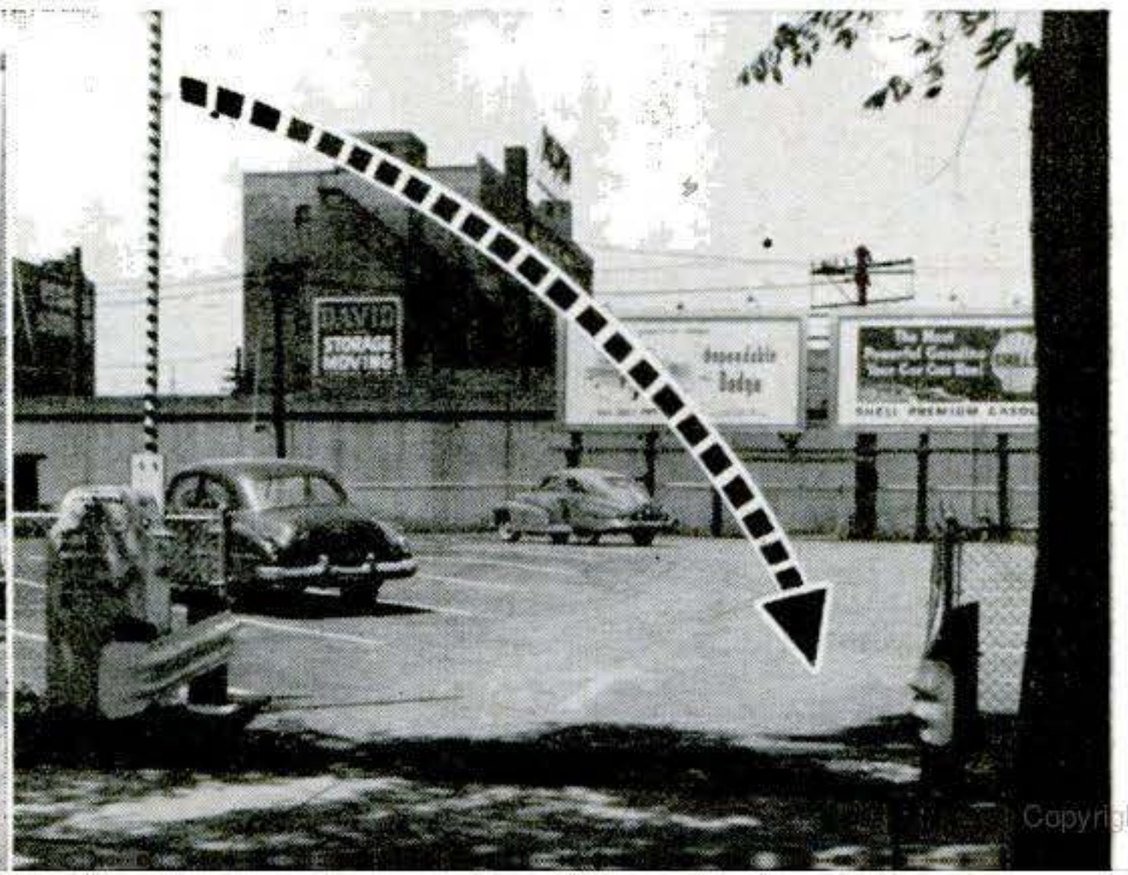
On 30 parking lots in Chicago, electronic watchmen are collecting fees and opening barriers to let cars in and out. Exits as well as entrances are guarded so that drivers won't be tempted to ride in through an exit and park free.

Three types of electronic gate tenders, in use at three different lots, are shown in the photos.

The card "key," shown above, costs the parker $12.50 a month. The "tumblers" in the control box are changed and new cards are issued every 30 days. The sliding platform below rides on rails, powered by a two-horse power electric motor beneath it. It shuts off automatically when the lot is filled, and starts operating again when cars leave.

COIN-OPERATED PLATFORMS slide incoming cars to right so they can bypass barrier. When car drives off, electric eye causes motorized platform to shift back where it started.

A QUARTER LIFTS THE GATE at the Winthrop St. parking lot below. Once a car has passed through an electric-eye beam at the lot entrance, the gate comes firmly down again.



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Meet Mr. Guided Missile

Young Nevin Palley, designer of push-button weapons, is also a mighty handy man around the house.

By Herbert O. Johansen

IT WAS a hot, humid day in Dallas. We were sitting in the shaded kitchen of 38-year-old Nevin Palley's suburban home.

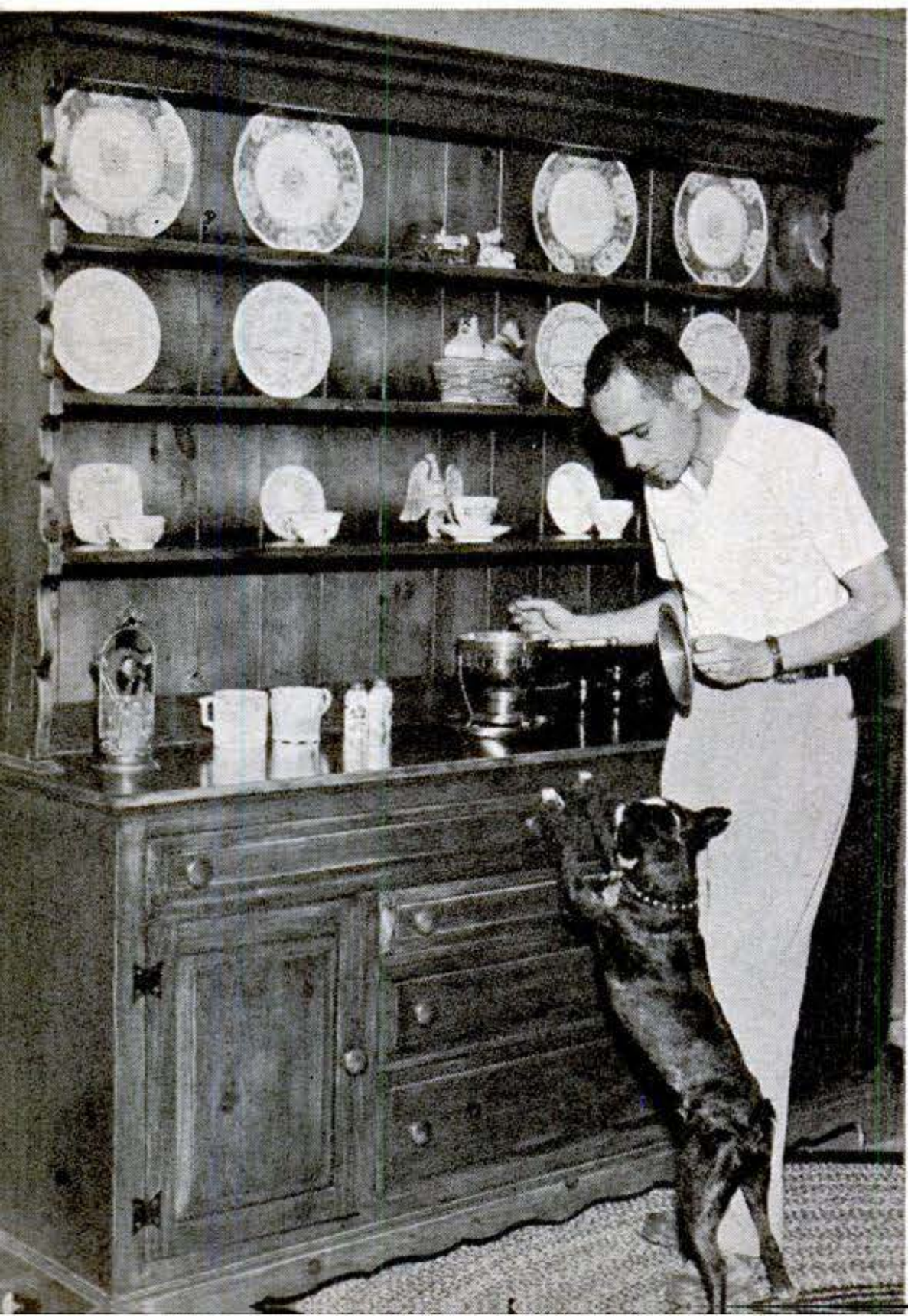
Palley had designed and built the handsome wooden table on which an assortment of crackers and cheese lay before us. He had also designed Regulus —the Navy's new guided missile that can be launched from a submarine and has a built-in electronic brain to seek out and destroy a target.

For the table, Palley told me, he had used only hand tools. He finds them more relaxing than power tools. Perhaps that is because in designing missiles he works with the most complex tools in the world—people.

Palley feels that there was a time he wouldn't have been able to do the job he is doing today as chief of missile design for Chance Vought, with some 600 engineers under him. That was when he was more interested in things than people. Then he learned that all companies have the same engineering data, laws of physics and slide rules, but that it takes people to make them work better.

Now he puts people before things—the people whom he credits with the success of the Regulus missile. And it may be significant that in his design work he uses a small, six-inch slide rule—putting "things" in their proper place.

It was a strange setting for an inter-



DUTCH CUPBOARD was built by missile-designer Palley with hand tools. He also is handy with the chafing dish and can cook up a Welsh rabbit that is something special.

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Son John looks on as Daddy puts the finishing touches on model of an old Curtiss pusher.

view with a guided-missile mastermind. We were surrounded, not by scientific apparatus, but by kitchen appliances intended to give a mother more time to devote to three small children and a lush garden of gardenia bushes, roses and petunia beds. And the mother, pretty and cotton-cool Mrs. Palley, was there. So were the children, six-year-old Mary, in-between John and two-year-old Richard. Elmer, a frisky Boston terrier, completed the company.

Nevin Palley spends only about a fourth of his off-work time at home—and this was part of that precious time. They weren't going to miss a moment of it. In fact, it was only a few months ago that Mrs. Palley, like the wives of all the workers on the new Navy missile, learned what her husband had been doing away from home and working nights since 1947 when the project started.

Nevin Palley is no long-hair. He wears his dark hair in a crew cut that makes him look younger than his 38 years. He is slim, erect and tall, and distinguished by an intense, alert look.

His features give a clue to his ancestry. His Russian-born father came to this country in 1890, and today, at 70, is still active in a successful metal-cabinet and kitchen-equipment business in Pittsburgh, where Nevin was born on April 12, 1915.

Although Palley became interested in aviation as a youngster through model-

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plane building and reading about Lindbergh's epoch-making flight across the Atlantic, the die of his career wasn't cast so easily. Young Nevin wanted to be a doctor; a scholarship to Carnegie Tech while he was in high school indicated engineering.

First Engineering, Then Pre-Med

He accepted the scholarship, but after two years decided that engineering wasn't for him. He quit and took half a year of pre-med. That made engineering look so good that he returned to it, graduating from Carnegie Tech in 1937. By that time aviation was in his blood. He had done wind-tunnel work, designed and flown sailplanes and worked during vacations in aircraft factories.

His first job was with Lockheed in Burbank, Calif. As an aerodynamicist he did performance curves from other people's calculations. He wanted more creative work and got it on the XP-38, the forerunner of the famous World War II twin-engine Lightning fighter.

An opportunity to work on new wing shapes that were just then being developed to lick the problems of higher speeds took Palley to North American, another California firm.

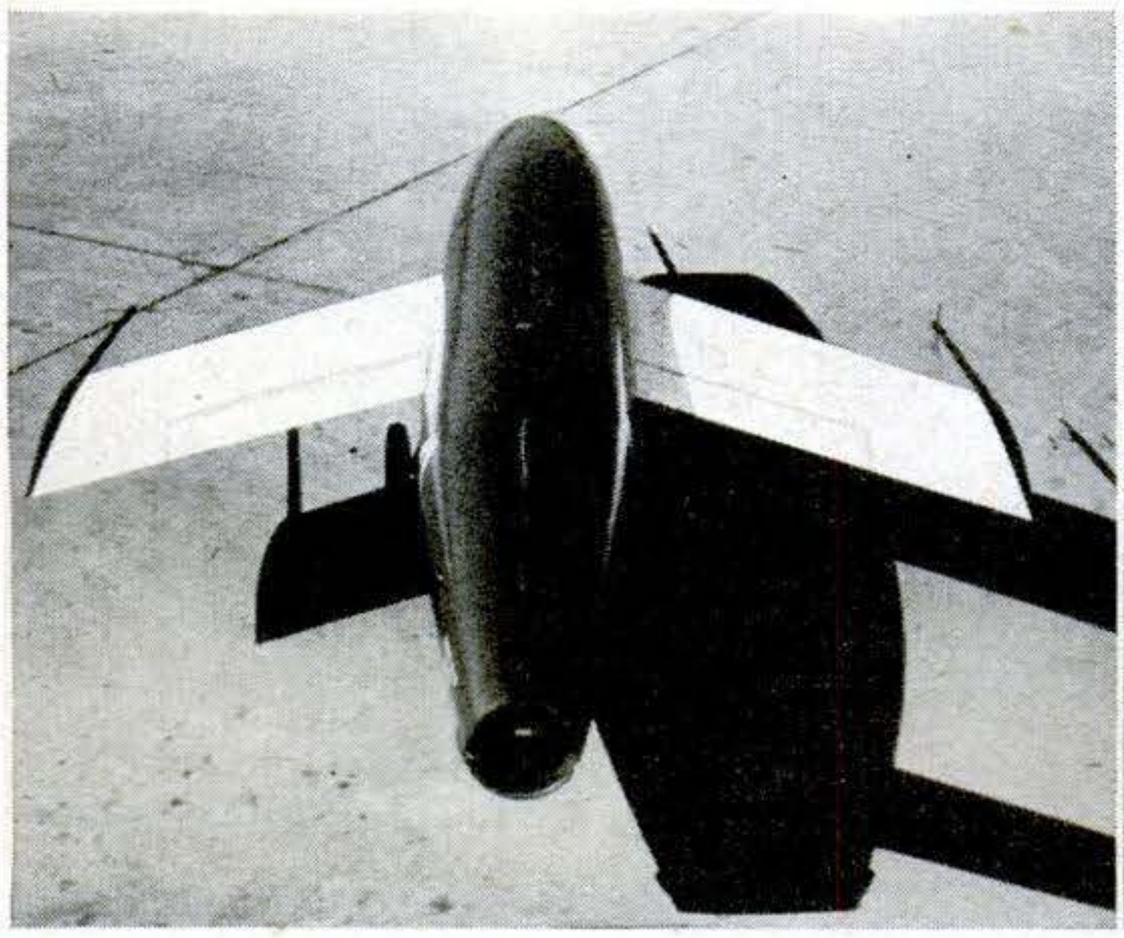
He liked life on the West Coast, but the magnet of new experience drew him to Curtiss-Wright in Buffalo, N. Y. That was in 1939. There he got a chance to do original design on the XP-60, the first airplane to use a laminar-flow wing. He also met his wife.

The summer of 1941 saw him, now married, on the move again—seeking new aerodynamic challenges. At Stratford, Conn., he knocked on the door of James Shoemaker, then chief project engineer for the Chance Vought Aircraft Division of the United Aircraft Corp. After two hours he came out and told his wife that they had found a new home. He had decided to stay in exchange for a promise.

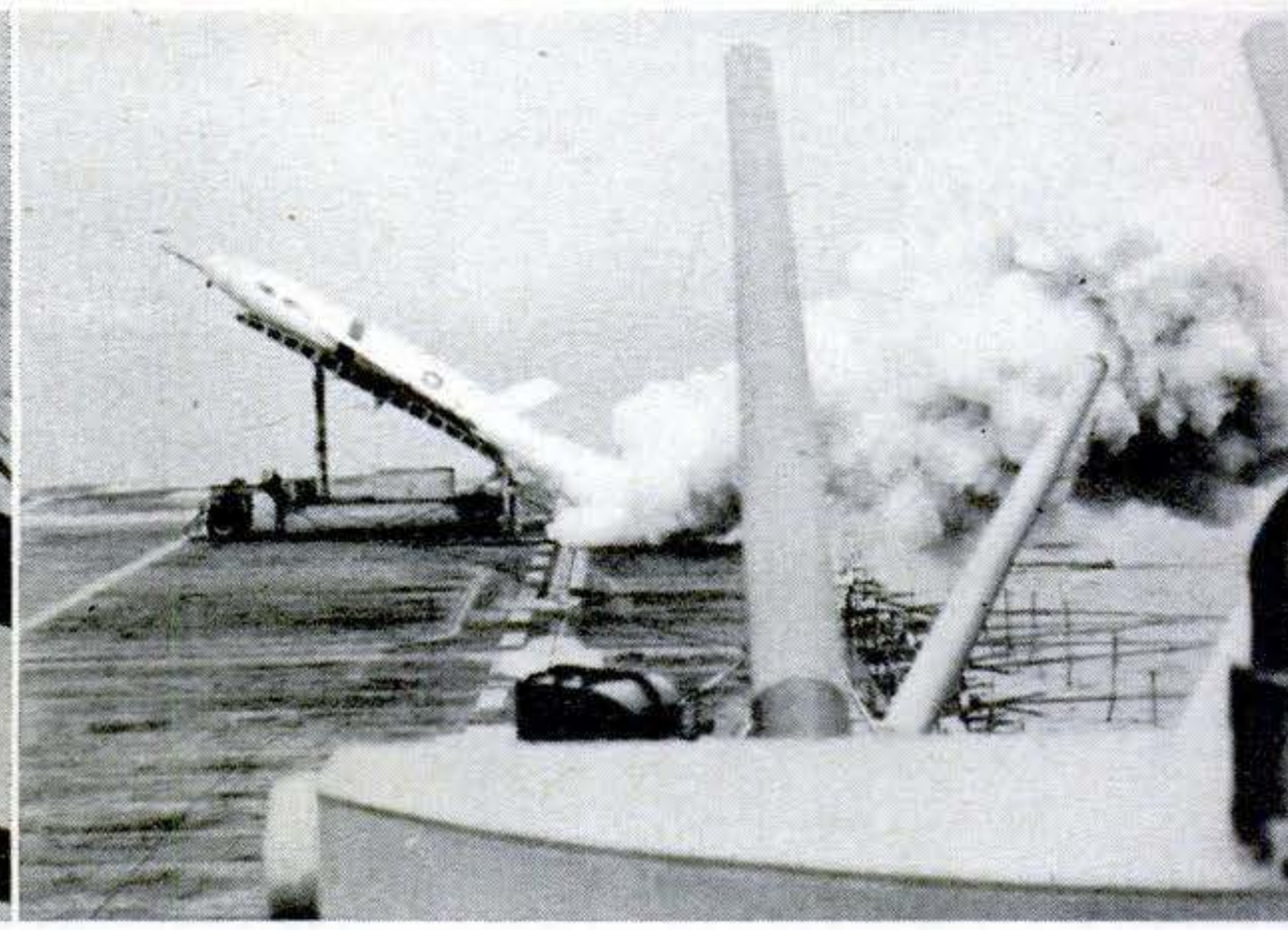
Becomes Head of Design Group

The promise Shoemaker had made was that if Palley came through on some more or less routine work he would be made head of the preliminary design group. At the end of six months he got the job and his big chance—original studies on the military versions of the experimental Flying Pancake that scared the pants off many a Connecticut farmer and gave rise to numerous flying-saucer reports during its test flights. It was all-new and unconventional in power plant, wing and general configuration. Next came revisions and improvements in the Navy Corsair.

At about this time early jet studies were being made by Palley's group. The



PALLEY'S BABY, Regulus, resembles a small, conventional, swept-wing jet airplane. This new Navy guided missile is about 30 feet long and can carry a powerful warhead.



ROCKET BOOST is used to launch Regulus guided missile from deck of the aircraft carrier *Princeton*. Many test missiles have been flown at speeds faster than that of sound.

Copyrighted material

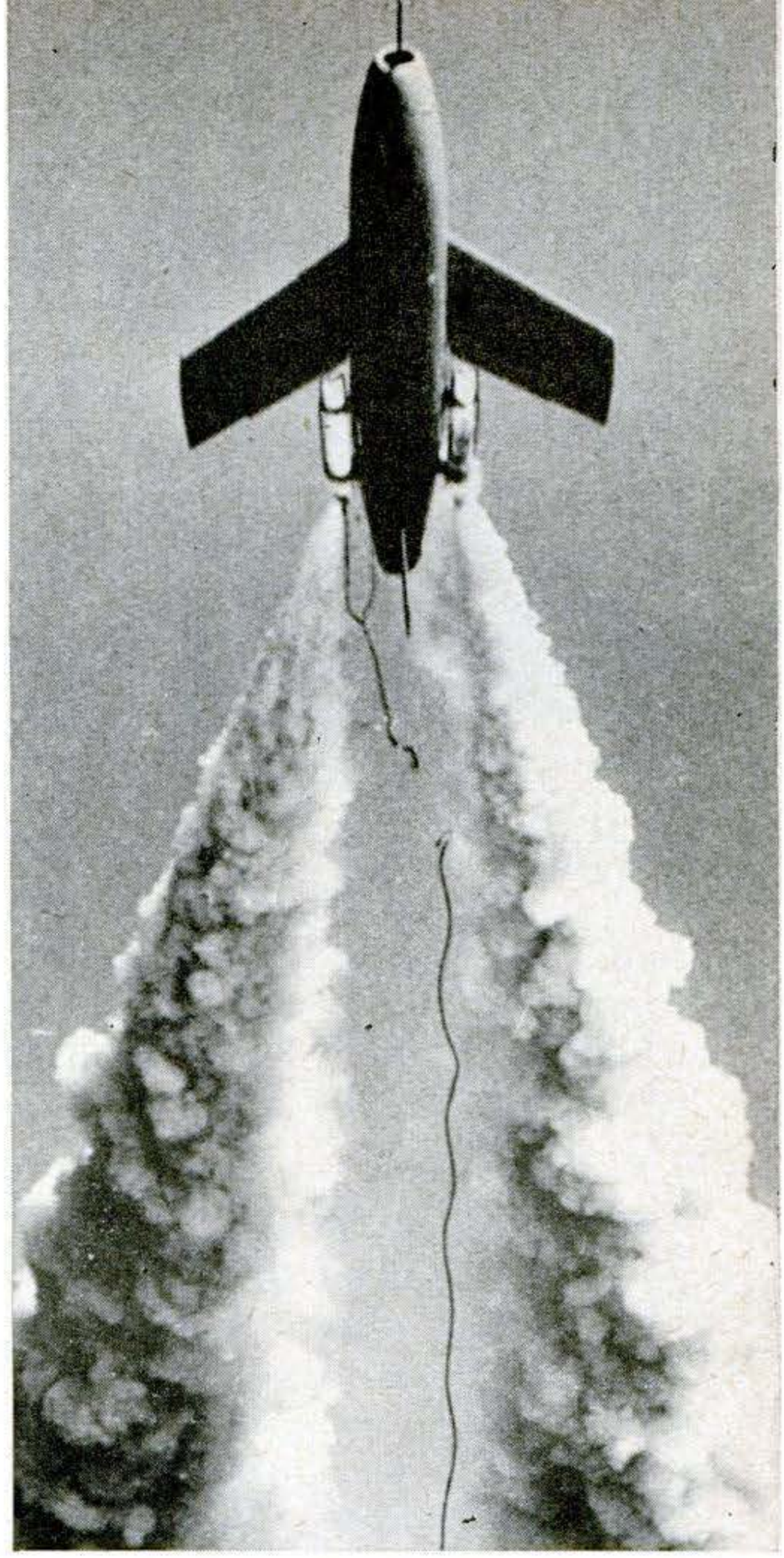
studies culminated in 1946 in the development of the high-speed, swept-back tailless Navy Cutlass twin-jet fighter.

Again Palley was faced with no challenge to satisfy his creative urge. He felt that the Cutlass was the ultimate design in piloted jet carrier fighters—that he had gone as far as he could along that line. Fortunately, at about that time "liberated German data" was being made available —meaning guided missiles.

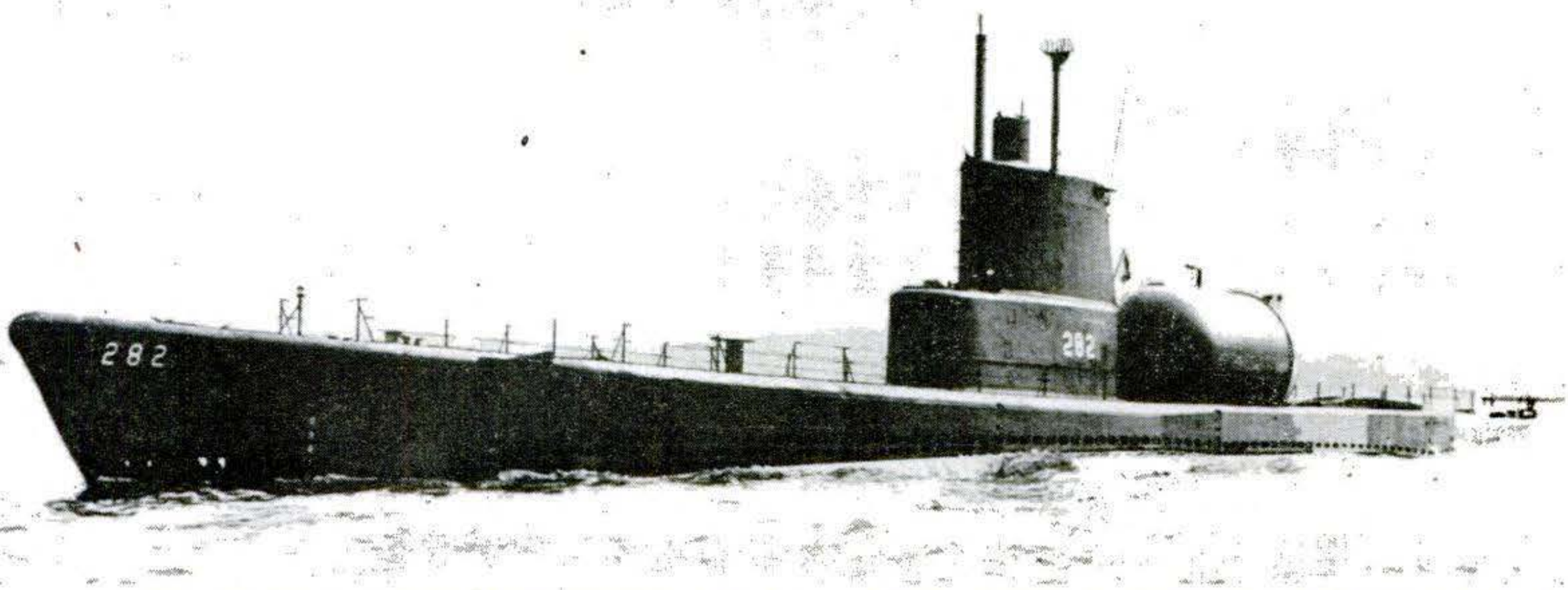
When Chance Vought embarked on guided-missile studies for the Navy, Palley initiated the work and injected himself right into the middle of the project. His request for permission to follow through was granted, and so, with a small group of about 30 engineers, he nursed Regulus from its infancy to the recent dramatic debut when it was fired from the carrier *Princeton* at sea near San Diego, Calif. During that time Chance Vought had moved from Connecticut to Texas, in one of the greatest mass-moves of industry.

Whether Regulus actually has been fired from the submarine *Tunny*, modified to launch it, had not been revealed at the time this was written. But that is its design destiny, says Palley: a combination strike at the enemy—the surprise of a submarine plus the high-speed penetration of the missile.

Careful to avoid any personal ac-



CLIMB of Regulus is almost straight up. Test versions have tricycle landing gear so that missiles can be recovered and their recording instruments studied.



SUBMARINE *TUNNY* has been specifically modified to fire the Regulus. A short-rail launcher has been installed on the afterdeck. Tanklike object just behind the conning tower is the guided-missile hangar. A World War II submarine, *Tunny* also has been modernized by the addition of a snorkel and streamlining of the hull and conning tower.

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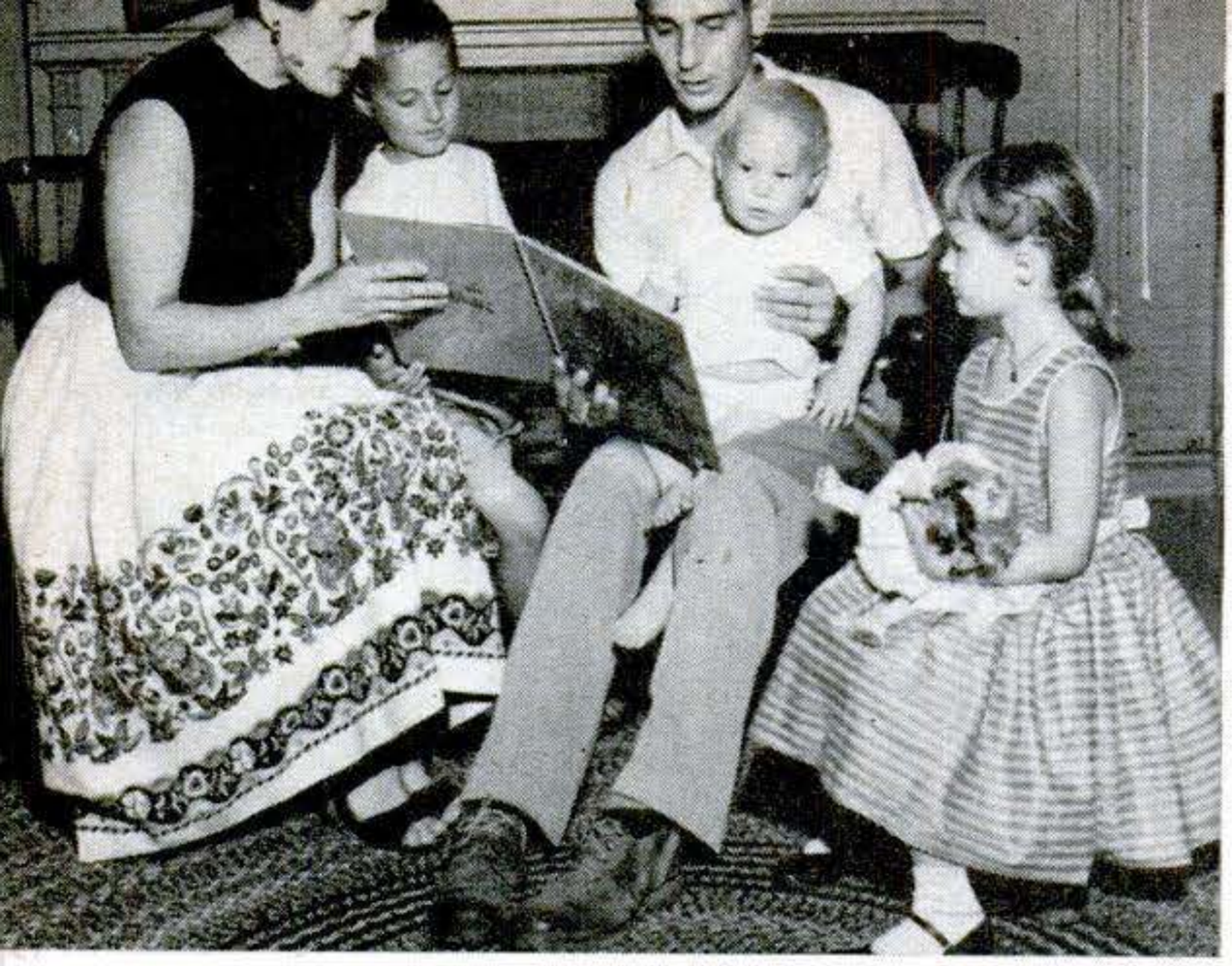


THE PALLEY FAMILY at home (left to right): Mrs. Palley, John, Palley with Richard in lap, and Mary. The home photos were taken by Wayne Sanford of Chance Vought.

claim, he points out that any modern airplane or missile is so complex that no one individual can be given credit for its development.

He Gathered the Right People

"For my own part," says Palley of Regulus, "all I did was to gather together the right people and try to stimulate them."

An example of how well he did that job is the case of Samuel Oliver Perry (a descendant of Commodore Perry), the man who has personally directed all Regulus firings and is credited with much of the success of this missile. Palley found him in the "mold loft," where tool templates are made, recognized his ability and drafted the young engineer for Regulus. In charge of all test evaluation on the missile, he spends most of his time at Muroc Dry Lake in California, where he has become known as "Seven-knot" Perry. Palley won't vouch for the story of how Sam came by the name, but here is how it is told:

Early-morning test launchings of Regulus were restricted to a seven-knot wind limitation. As tests progressed, however, Perry's estimate of wind velocities became increasingly flexible. One day the winds across the dry lake reached a howling 60 knots. Perry, anemometer in hand, was seen literally leaning into the teeth of the gale.

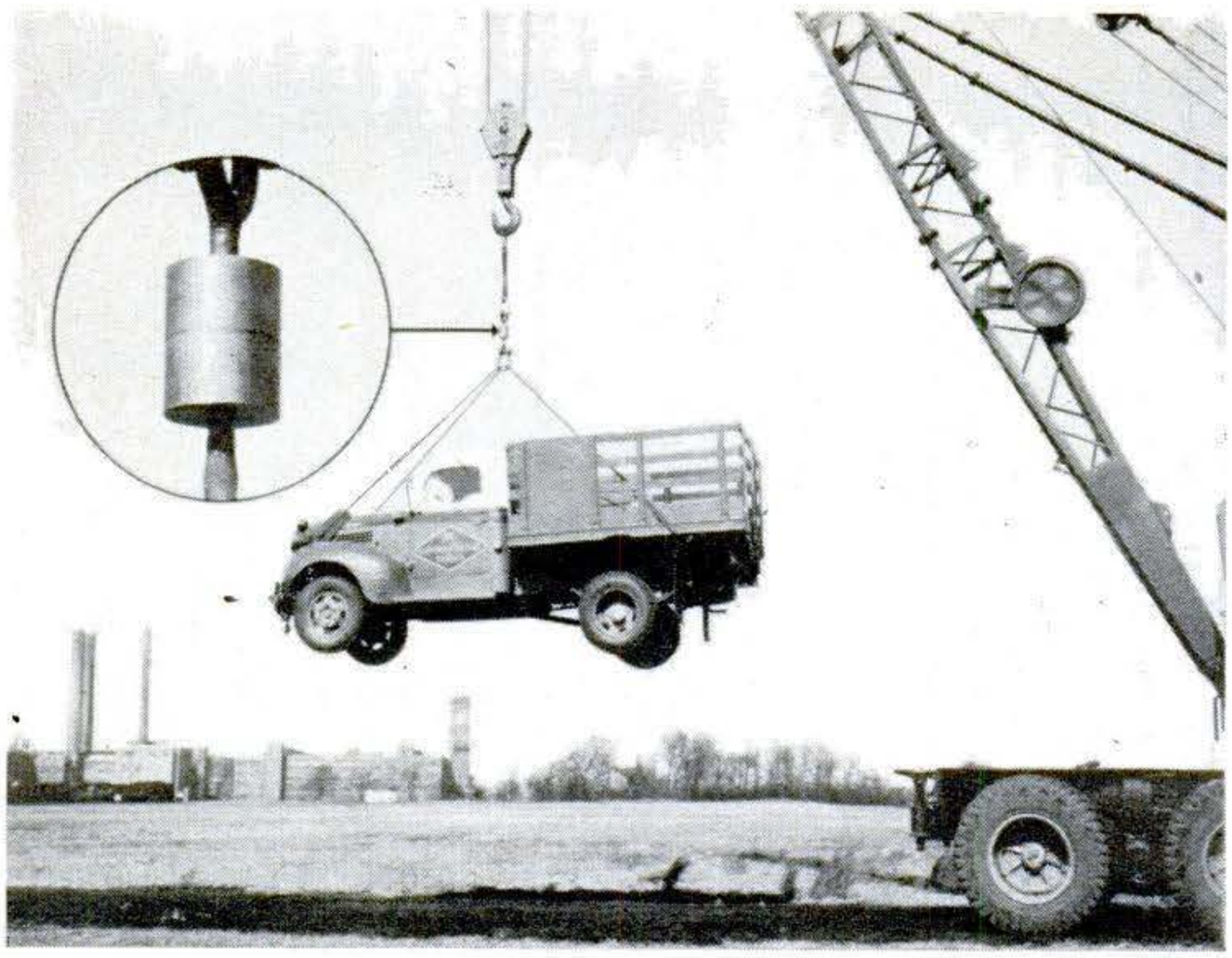
"What's the wind?" he was asked.

"Seven knots," he replied without hesitation.

Now that it can be told, Palley and his wife, when urged, will entertain their friends with anecdotes like that about the trials and tribulations of guiding a guided missile through its days of secrecy.

[Continued on page 244]

New Glue Makes Link That Lifts 5,000-Pound Truck



TO FORM a connecting link in lifting the big truck at left, two steel blocks, four inches in diameter and with machine-ground surfaces, were bonded together with an adhesive called Pliobond (see blown-up inset). After being used in the truck-lifting demonstration, the same two blocks, still bonded together, supported a weight of 19,150 pounds in a laboratory experiment. Goodyear Tire and Rubber Co., maker of Pliobond, claims that the adhesive will "bond anything to anything."

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How Germans Plan to Go to the Moon

It's really quite simple to get to the moon, visitors were told at a recent interplanetary show in Dusseldorf, Germany. Just the thing for the ride, they learned, is a globe-shaped rocket landing ship (above)—and a big relief model of the moon's surface showed the majestic landscape that the lunar sightseers would view.

There are a few details to be arranged first, such as building an artificial satellite as a way station in space. Four billion dollars, five million tons of fuel, and 1,000 trips by 80 king-size rockets should take care of that. Models showed a four-section rocket fueling for take-off (center) and its interior (bottom view), with couches for use during acceleration.

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Trim Board Has Rotary Cutter

A SELF-SHARPENING wheel is the cutter on this trim board. Riding along an I-beam track, the wheel, replacing old-type chopper blade, cuts paper, film, plastic and other sheet materials. Made by Zeus Rolcut Co., Sausalito, Calif.

Makes Coffee as You Drive

THE young lady is enjoying a cup of coffee made by a German gadget that clamps onto the dash and plugs into the car's electric system. Hot water filters through powdered coffee into a cup. Cuno Sievers, NYC, distributes Paluxette.

Cowboys Now Ride Copters

THERE'S a new cowhand on one of the Lone Star State's largest ranches. It is a helicopter that flies the range of the Waggoner Estate's Zacaweista Ranch, a 500,000-acre spread across six counties in north Texas.

During roundup time, in heavy brush country, the Bell copter does the work of 15 to 20 cowboys on good horses. That is the estimate of Tony J. Hazlewood, veteran foreman of the ranch who flies with the pilot, working in front of the horse-borne cowboys.

After flushing the cattle out of the thick, matted brush where they are difficult to reach on horseback, the copter maneuvers to help the cowboys bunch them into a fence corner for branding.

Between roundups, the helicopter is kept busy on many other jobs, such as riding the ranch's 2,700 miles of fence, patrolling water tanks, wild-game surveying and aerial warfare on predatory animals.

READY FOR ROUNDUP operation, ranch-foreman Hazlewood climbs into the copter. Pilot Sherman Kennedy is at the controls.

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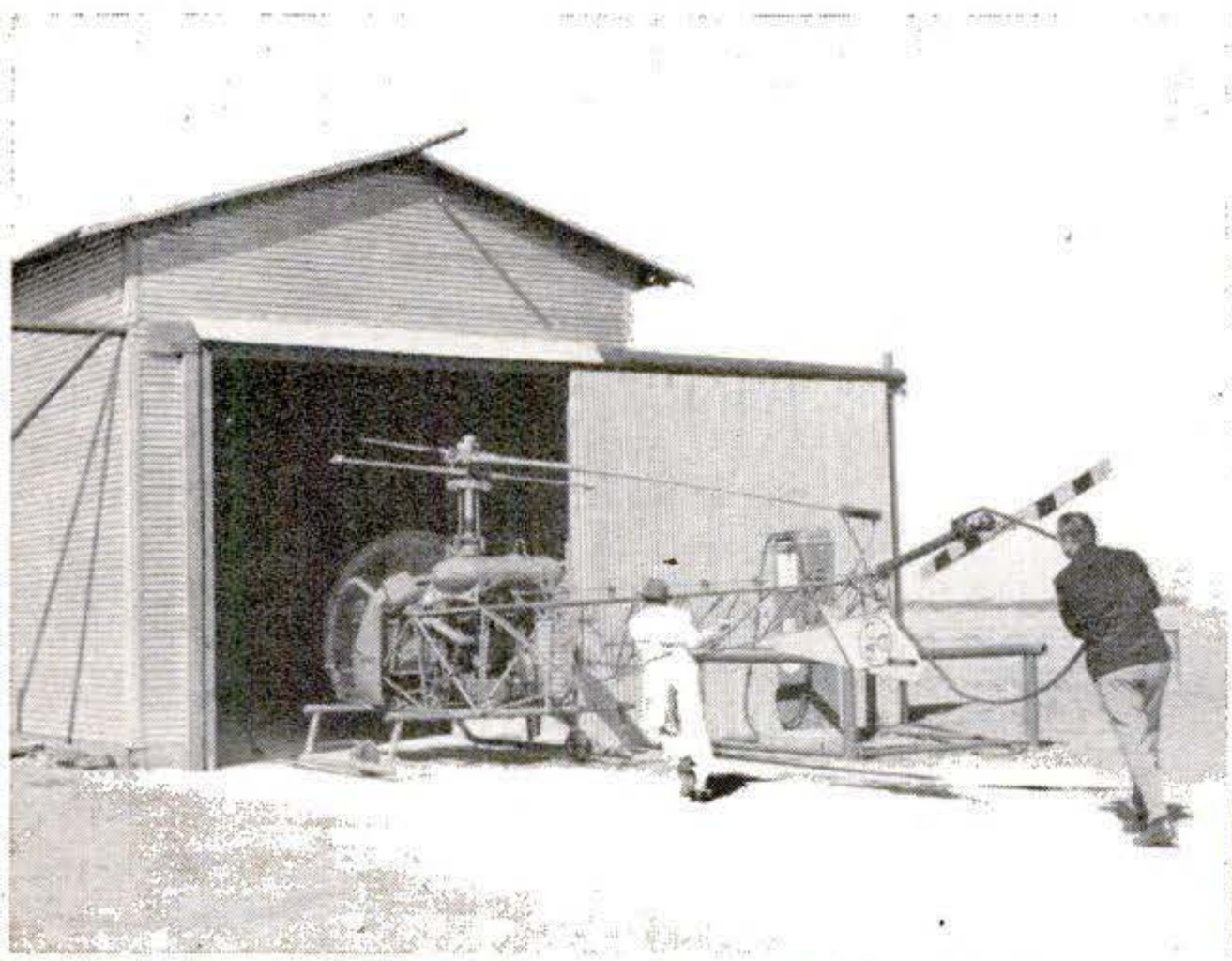
COWBOY HELICOPTER casts shadow on cattle range of Zacaweista Ranch, near Vernon, Texas. Slow speed and maneuverability make rotary-wing aircraft good cattle herders.



SMALL SHED houses the easily handled, ranch-riding egg beater. Note the Waggoner Estate brand on the helicopter's tail surface.

HELICOPTER has helped these grounded cowpokes to drive cattle into a fence corner for branding and handling.

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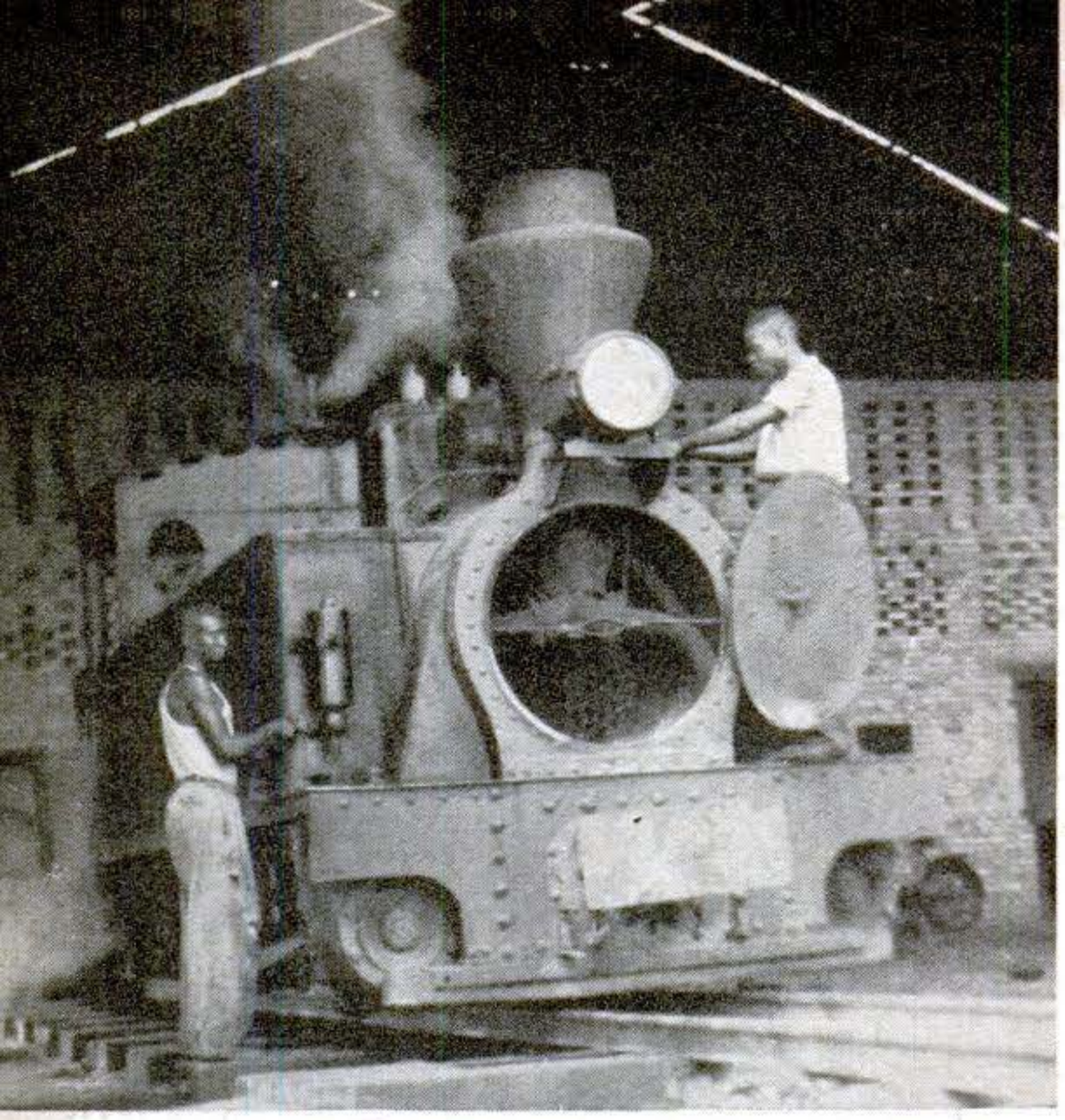

DIESELS will soon replace antiquated little Belgian-built side-tank switchers.

Railroad

By Henry B. Comstock

Jigsaw puzzle of midget lines will soon wheel the wealth of the Congo down to two oceans.

IN 1485, a Portuguese navigator named Diogo Cam sailed boldly down the west coast of Africa to the mouth of the Congo River. Forcing his way some 90 miles up the great brown stream, he discovered what has been bothering African explorers, industrialists and military men ever since—32 thundering rapids and cascades that bottle off thousands of miles of jungle-piercing, navigable waterways to the east.

Today, nearly a million tons of freight a year must be portaged around those rapids of the lower Congo on a busy little railroad whose gracefully sprung viaduct and tunnel arches, spit-and-polish trains, and tile-roofed, yellow brick stations might well have been ordered from the latest toy-train catalogue.

Although this Matadi-Leopoldville Railway has brought you the makings of many a bar of Lever Brothers' soap, chances are that you have never heard of it.

In another five years you will. For this tiny picture-book railroad of west Africa is destined to play as important a part in your world of tomorrow as the Pennsylvania Railroad or the Union Pacific system does today.

If you don't believe it, take a look at the map of Africa which appears on the facing page.

Just south of the equator, and midway across the continent, there is a spot in the Belgian Congo where Geiger counters chatter like a set of false teeth shaken by tropical fever. This is Katanga, under whose parched hills lies half the earth's known store of uranium. Thrown in as attractive side dishes are enough copper to supply all the world's needs for the next 200 years, tin reserves second only to those of Malaya, great iron deposits, Africa's largest industrial diamond fields, and a liberal sprinkling of zinc, cobalt and magnesium.

An all-rail line driven from this equa-

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Across Africa to Tap Hidden Treasures

DAHOMEY
NIGERIA
FRENCH EQUATORIAL AFRICA
SUDAN
ETHIOPIA
BRITISH SOMALILAND
SOMALIA
TO SUEZ CANAL
RIO MUNI
Mississippi-type stern-wheel steamboats ply here
Heavy jungle on both sides of the river
Many rapids and cascades
CONGO RIVER
MATADI-LEOPOLDVILLE RY.
BELGIAN CONGO
KENYA-UGANDA EXTENSION
Line being widened to 3' 6" gauge
Leopoldville
Kasai River
Engineers' School
Matadi
ANGOLA
LEOPOLDVILLE EXTENSION
Line would have to cross 7 tributaries. Only surveys, so far
KATANGA EXTENSION
This line now being built
LEOPOLDVILLE-KATANGA-DILOLO RY.
steam boat crossing
Albertville
Tenke
Elizabethville
Benguela
BAS CONGO-KATANGA, BENGUELA RY.
Garratt type locomotives used here
UGANDA
KENYA
Lake Victoria
Machinnon Road
Hills here like N.E. Pennsylvania with tropical flora
KENYA-UGANDA EXTENSION
Mombasa
Military supply dump
KENYA-UGANDA RY.
Kigoma
TANGANYIKA
Tanga
TANGANYIKA RY.
Dar es Salaam
Lake Tanganyika
UPPER CONGO-GREAT AFRICAN LAKES RY.
Stanley found Livingstone here
Coconut palms along this coast
Lake Nyasa
MOZAMBIQUE
Industrial diamond fields
NORTHERN RHODESIA
Zambezi River
Big railroad car shops here
SOUTHERN RHODESIA
Bulawayo
VICTORIA FALLS
Railroad crosses the Zambezi River on a high steel viaduct, just below the falls, drenching passing trains in mist
BECHUANALAND
SOUTH-WEST AFRICA
Desert land
Pretoria
SOUTH AFRICA
CAPE-TO-CAIRO RY.
Capetown
MILES 100 200 300 400 500 600 700 800 900 1000

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MATADI-LEOPOLDVILLE RAILWAY used plenty of Belgian brick to give stations the thatched-roof look of native huts. Operator, upper right, sends call to next station, requesting

torial treasure house to the Falls of the Congo and the Matadi-Leopoldville Railway would become a vital link in one of the world's most important traffic routes.

But that is only half the story. Directly across Africa to the east of Matadi lies the great British military supply base of Mackinnon Road, in Kenya. To reach this hot spot on the Indian Ocean, all present shipping threads the Suez Canal. Cut off the big desert ditch, as Egypt has been threatening to do, and there isn't a single trans-African railroad that could be used to bypass the Suez. All heavy war matériel would have to be shipped around the Cape of Good Hope to reach Mackinnon's nearest harbor—Mombasa.

Now look at the map again. A railway line from Matadi to the mining district of Katanga could carry troops and supplies halfway to Mombasa. Link such a system to the British-owned railways in east Africa and you'd have a reasonably direct transcontinental line, one which would eliminate 6,000 miles of deep-water navigation.

That, in an African walnut shell, is what the Belgians and British have set out to do—to tie five (possibly six) existing railroads into a heavy-duty, through rail route from coast to coast. Already,

We'd Call It a "Hayburner"

GRANDS LACS RAILWAY engines burn wood, a fact one U. S. manufacturer forgot when building engines for the line. Natives must be sharpshooters to pitch logs through their coal-type fire doors.

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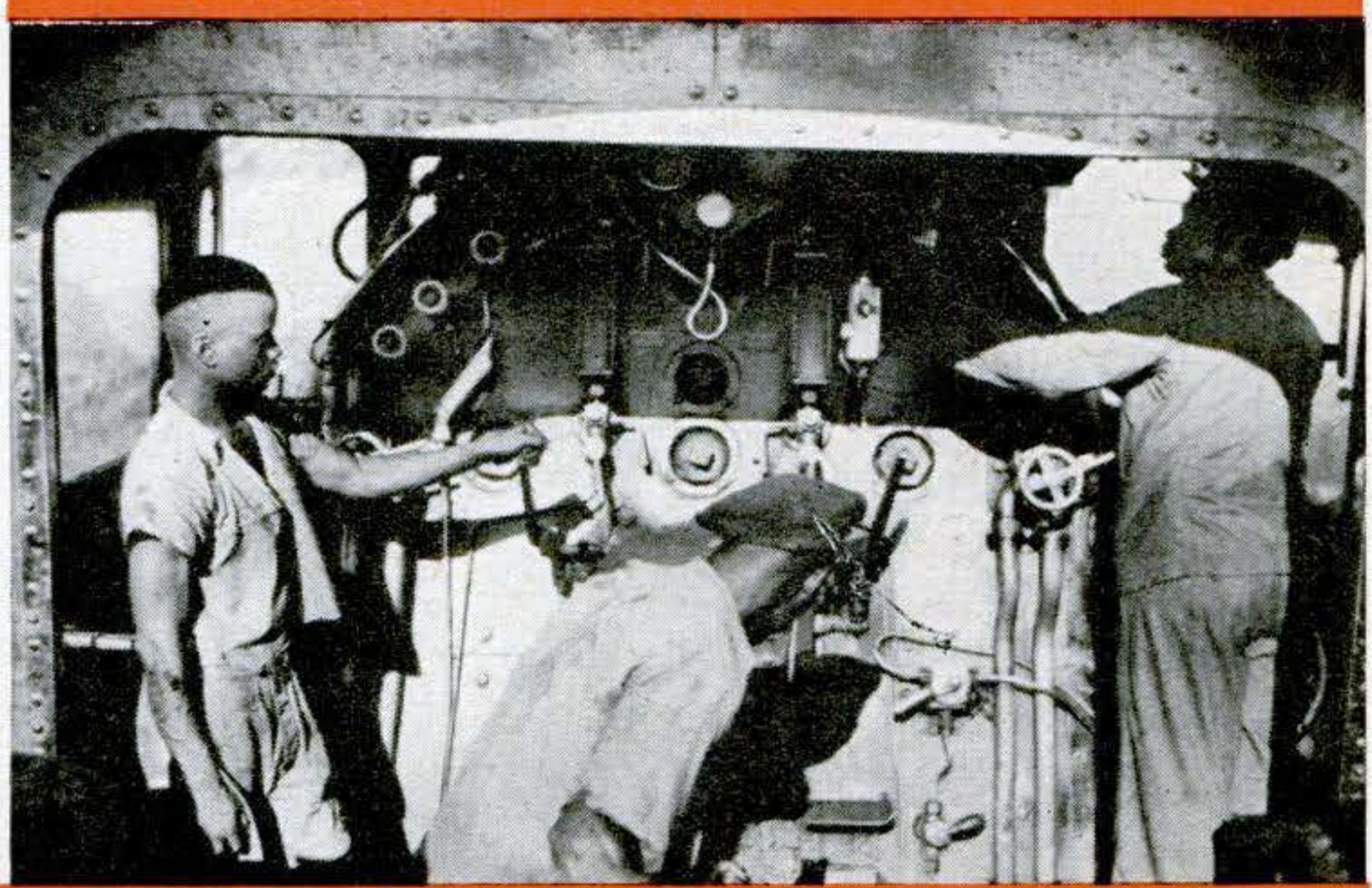
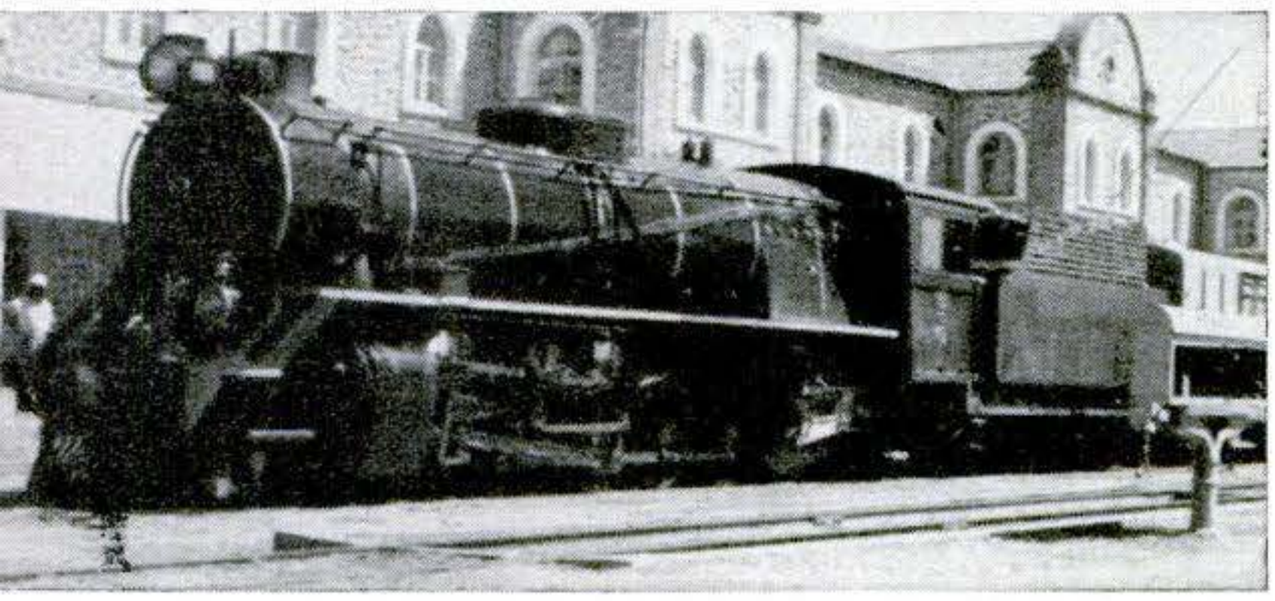


signal staff from machine at his left. If line is clear, signalman there presses button which releases it electrically, giving enginemen above authority to highball.

more than 900 miles of connecting lines are either being built or surveyed in the Congo's steaming jungles and broad savannas. Another 800 miles will be projected if the British go ahead with plans for a new railway across equatorial east Africa.

To see how the huge jigsaw puzzle is shaping up, let's have a look at the completed segments. They are:

- The Matadi-Leopoldville Railway.
- The Bas Congo-Katanga, Benguela Railway.
- The Leopoldville-Katanga-Dilolo Railway.
- The Upper Congo-Great African Lakes Railway.
- The Tanganyika Railway.
- The Kenya-Uganda Railway.



The Matadi-Leopoldville is the key to the projected network. The hazards that were overcome in building it, however, explain why you can stand at a point in Africa—fortunately, not along the proposed trans-African route—which is as far from a train whistle as Chicago is from Hudson Bay, the Gulf of Mexico, New Haven, Conn., and Dodge City, Kan. Each 623 feet of the Matadi's 227-mile length claimed a Belgian or Congolese life before the line reached Leopoldville in 1898. The road cost more

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than twice as much to build per mile as Colorado's comparable narrow gauges, and was cited as a classic example of the folly of driving iron in the tropics.

Today, all that is changed. Up-to-date machinery, and the amazing ability of the equatorial African to operate it skillfully, have done the trick. Your modern Congolese is an artist with a Bucyrus-Erie electric shovel, and an even better railroad man. Give him the kind of training the Matadi-Leopoldville offers him in the company's school at Cattier, and he will learn as much about fuel economy and diesel circuits as any hogger on the Denver & Rio Grande Western.

No befeathered chieftain of Henry Stanley's day was prouder of his blowgun than the dark-faced engineer of the 11-hour "express" between Matadi and Leopoldville is of his shiny new diesel locomotive. He is a man of affairs in his community. So are the 35 native stationmasters who maintain the most immaculately clean stations in Africa or any other continent.

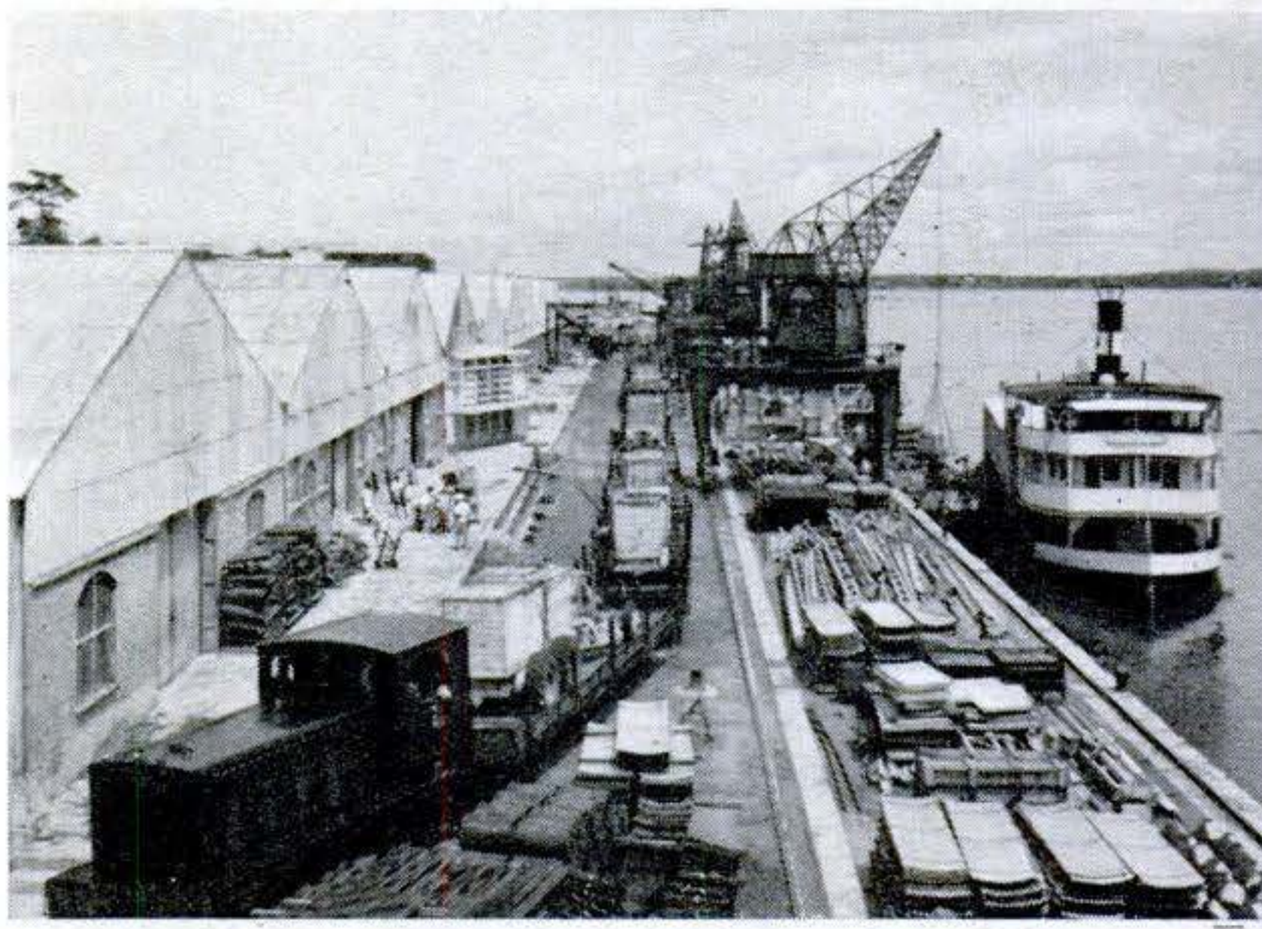
The Bas Congo-Katanga, Benguela Railway is one of the longer railways that can be tied into the trans-African route. In 1873 a young Englishman, who had been sent to South Africa for his health, stumbled onto the Kimberley diamond fields. Crystallized carbon is a great healer, and when he died, in 1902, Cecil Rhodes had driven his famous "Cape-to-Cairo" northward through the Dark Continent almost to Victoria Falls. With an eye for the vast mineral wealth of the Congo he had already offered King Leopold II, sovereign of the Congo Free State, a 60-percent cut of the earnings of a British-built extension of the Cape-to-Cairo, which he proposed to push across the Congo to the Sudan.

That Belgian Congo link was finally built. But it was not the one that Cecil Rhodes had planned. Katanga's ore exceeded even his wild dreams, and called for a speedy outlet to the sea. Today the Belgian extension swings off to the west in two great forking arcs, to carry close to five million tons of ore, an-

[Continued on page 252]

Photos from Belgian Information Service

FIRST BRIDGE on the trans-African railway will be the through-truss span in the background, which crosses the River M'Pozo east of Matadi, 90 miles from the Atlantic.



DIESEL SWITCHER works the docks at Leopoldville, where freight is transferred from Kasai and Congo river steamboats. Rails will eliminate 550-mile water haul.

INDIAN OCEAN TERMINAL of the trans-African rail route will be Mombasa, near British military base of Mackinnon Road. Tracks of Kenya-Uganda Railway must be widened to 3'6".

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Two triangular engines power this fast British patrol craft, formerly a German gunboat.

Triangle Engine Packs Power

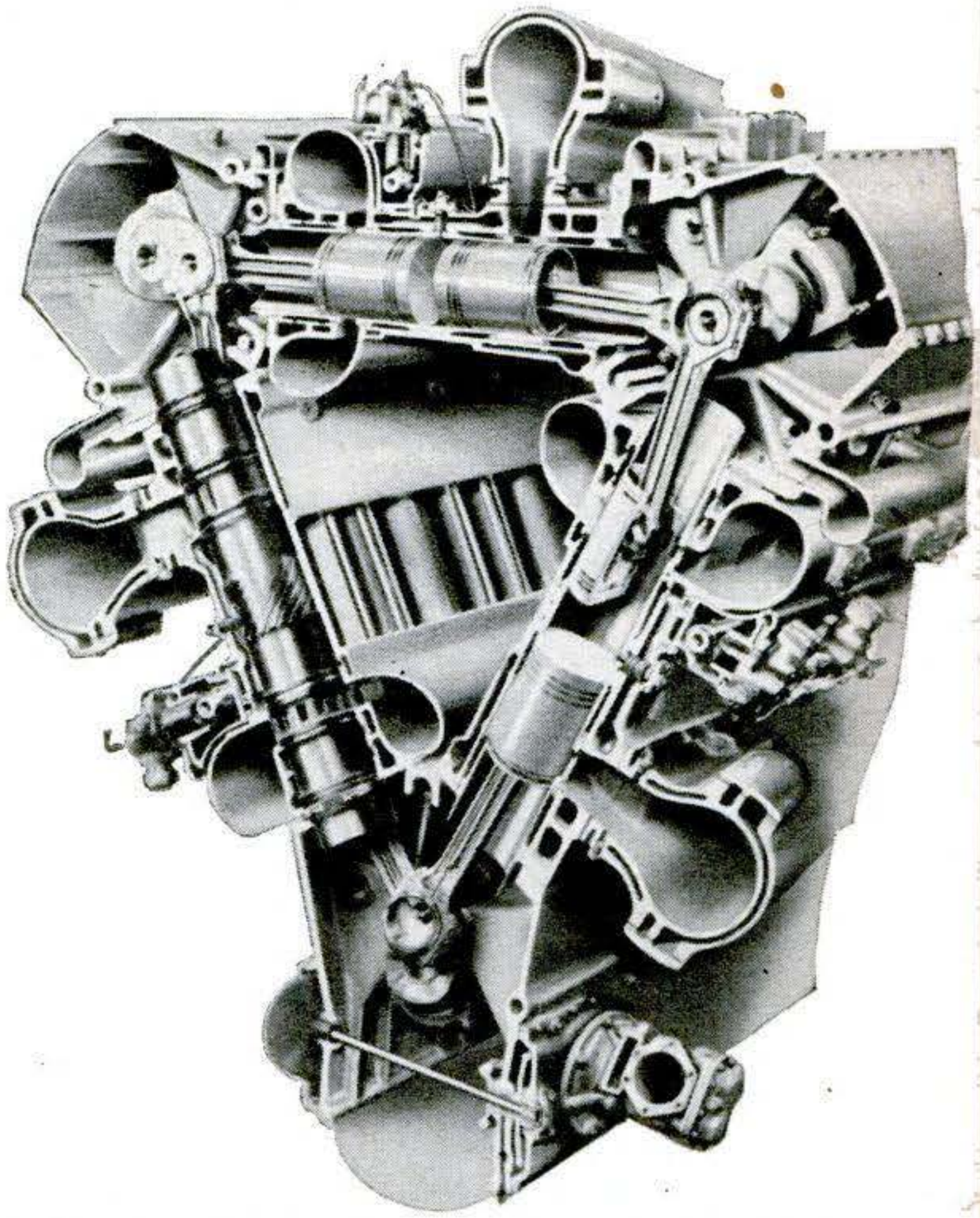
THE British Navy asked for a compact, lightweight engine to power fast patrol boats. What it got is a completely new diesel unit. Called the Deltic, after the Greek letter *delta,* it has 18 cylinders arranged in six triangular banks of three each.

Delivering 2,500 horsepower at a weight of 4.2 pounds per horsepower, it weighs 10,500 pounds, is only 11 feet long, about six feet wide and seven feet high. Napier engineers, who designed the unique two-cycle engine, believe that it has a future not only as a marine power plant, but as a stationary engine, for locomotives, and even in airplanes.

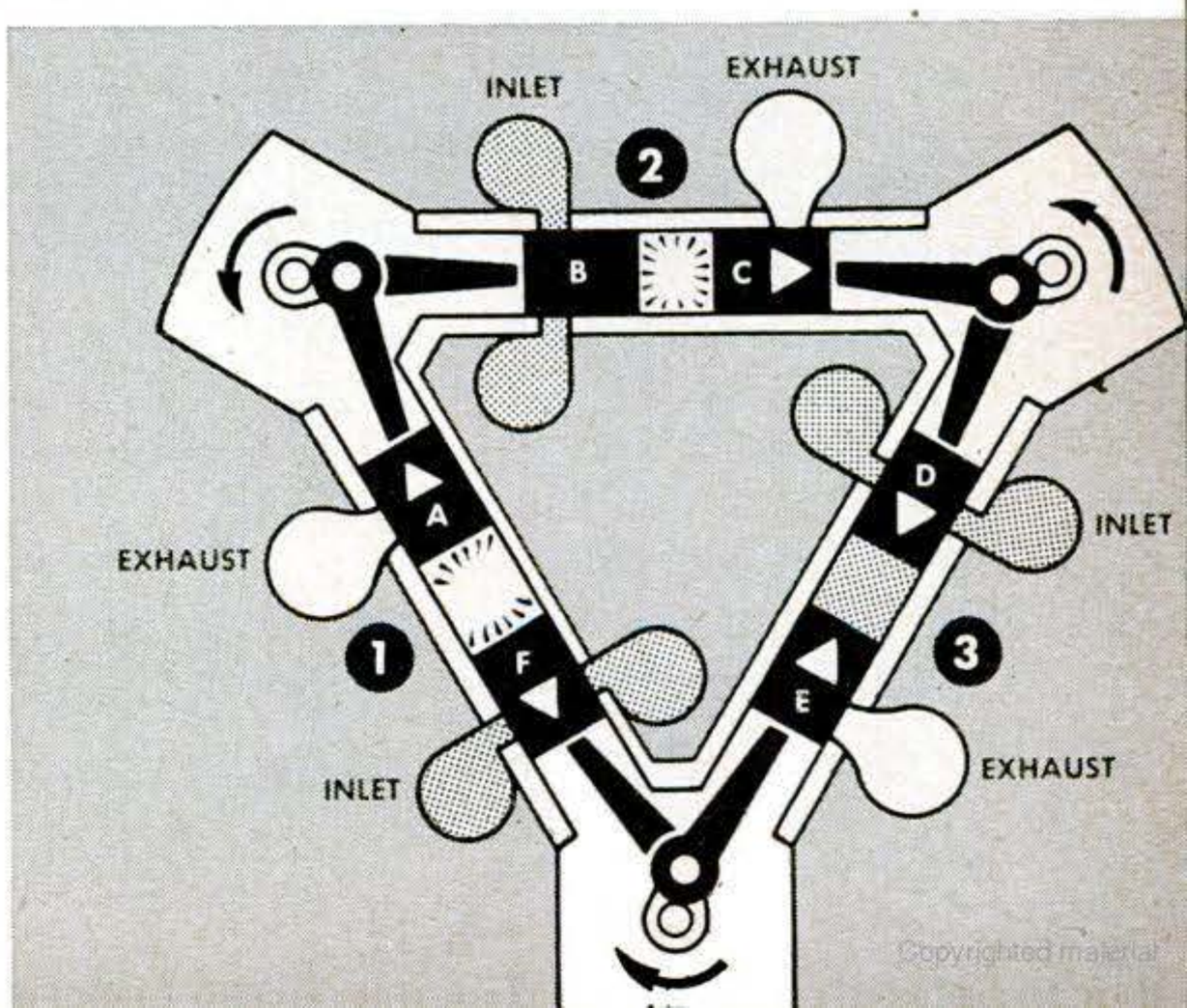
The photograph and drawing at the right show how it works. The Deltic has three crankshafts at the corners of a triangle whose sides are the cylinders. Each of the cylinders is equipped with two horizontally opposed pistons.

In the drawing, cylinder 1 has just fired, cylinder 2 is firing and cylinder 3 is about to fire. One piston in each cylinder controls the inlet port and the other the exhaust port. The exhaust pistons have a 20-degree crankshaft lead, so that they open and close their ports earlier than the inlet pistons do theirs. Thus, exhaust pressure is released before a new charge is introduced.

The crankshafts are geared together to drive a single shaft that transmits power to the propeller.



CROSS SECTION **through one bank of Deltic engine's cylinders is shown above. Below is sketch showing how opposed pistons behave during closed-cycle firing sequence.**



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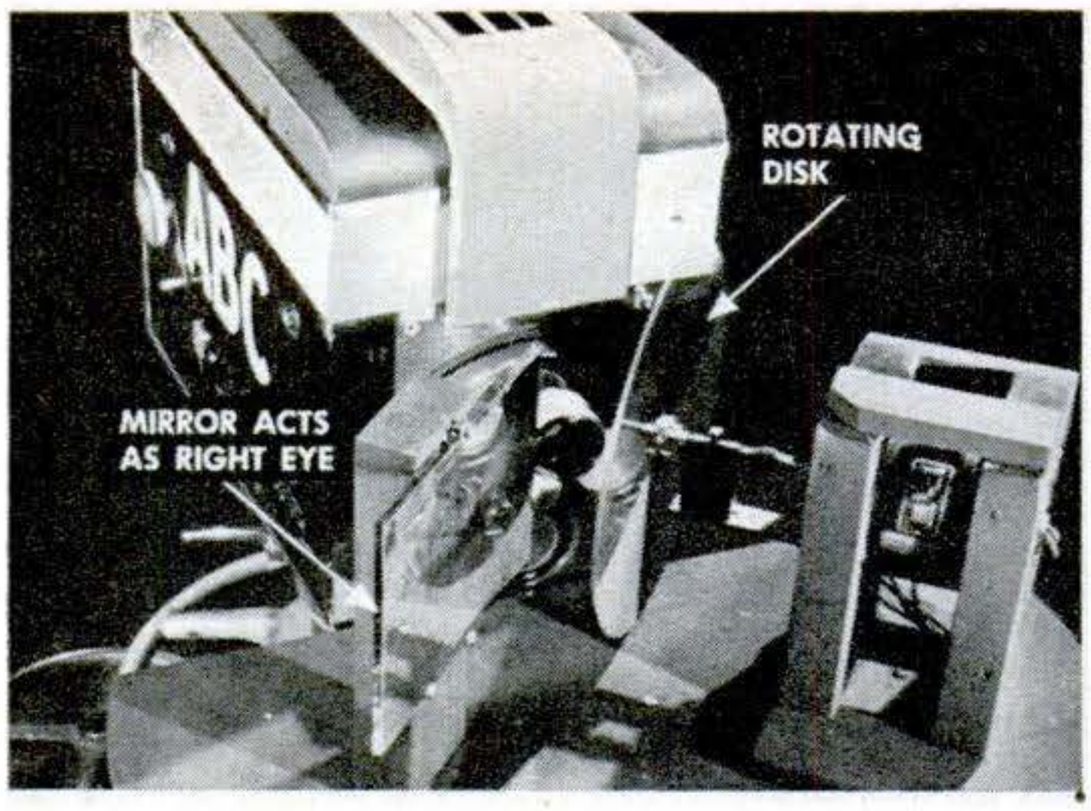
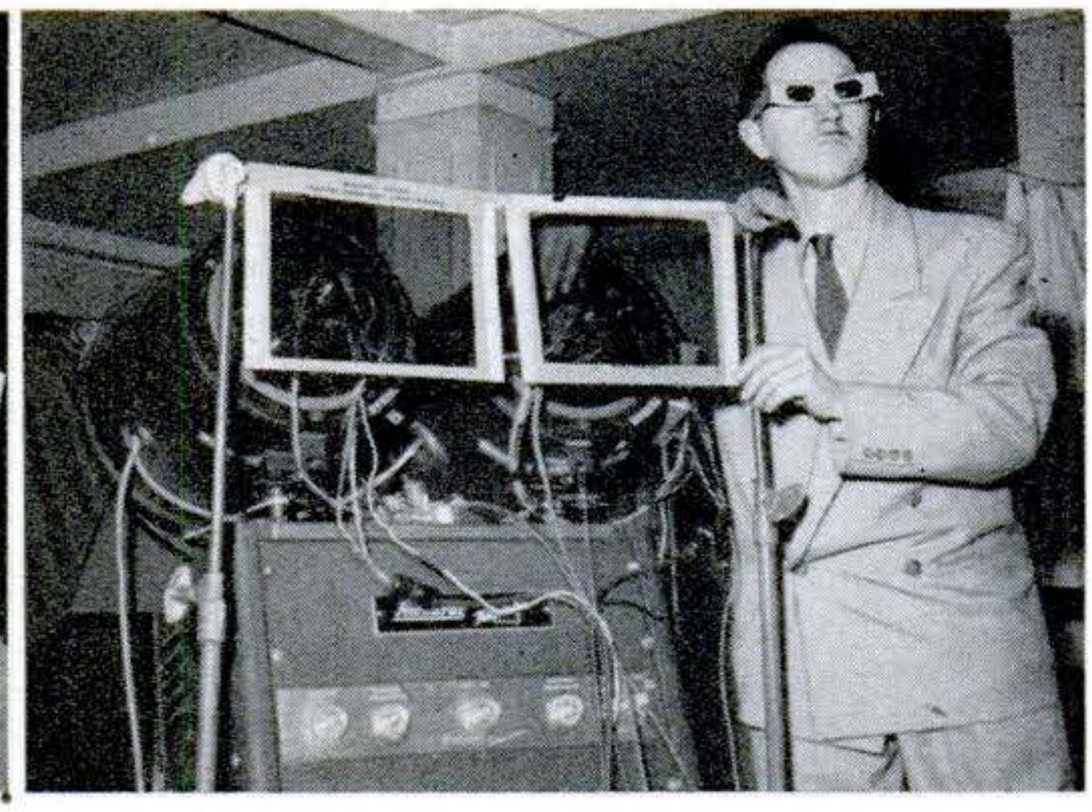
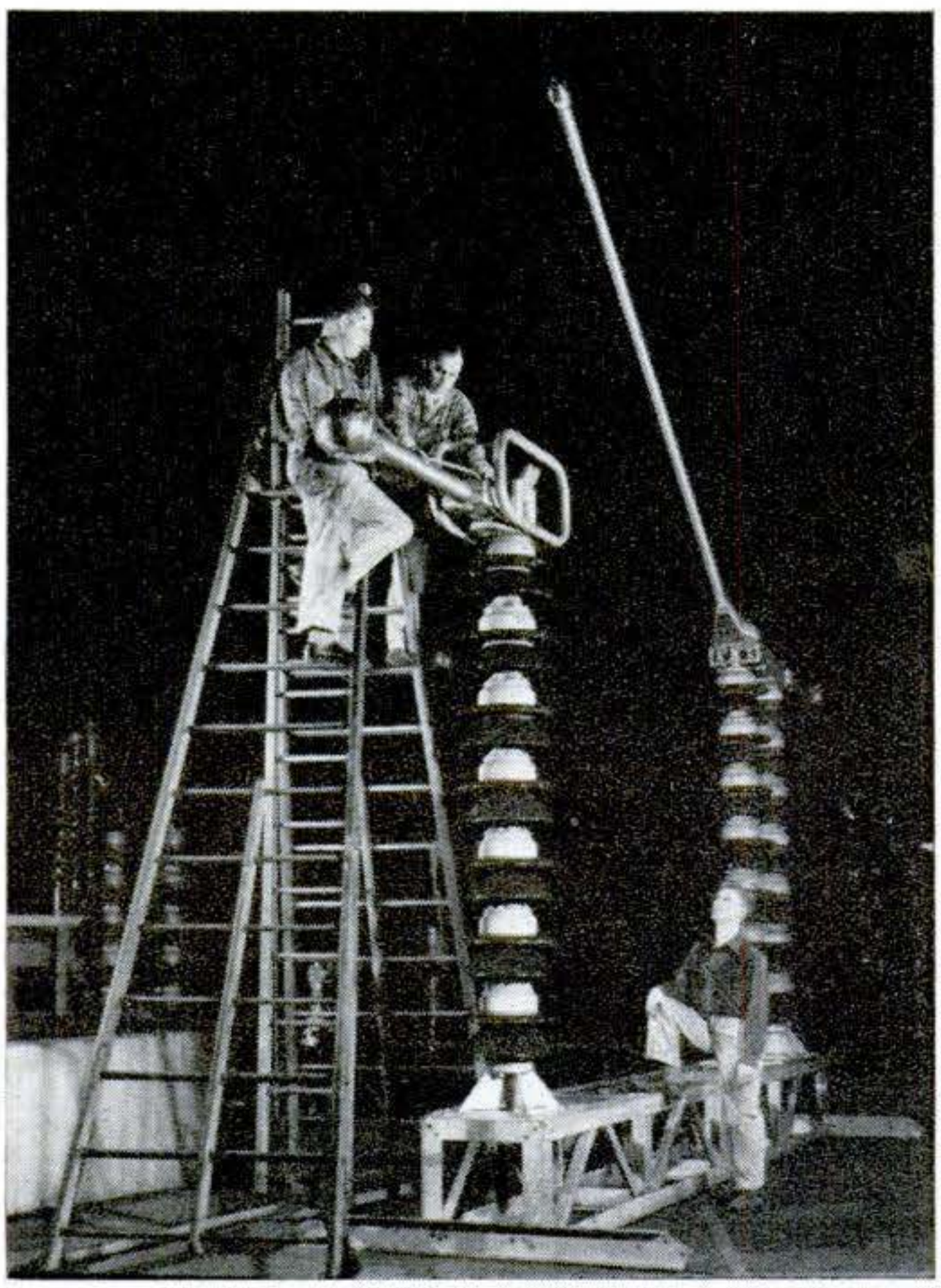




TV Moves in on 3-D — Camera Sends Two Pix, Eye Sees One

TV HAS invaded 3-D. On test programs, ABC has alternately telecast scenes as they would be seen with the left and the right eye. A rotating disk—half clear plastic, half mirrored—is set up before the camera (above left). A direct shot is taken through the clear plastic; then an image, bounced to the mirrored half by a second mirror three inches to one side, is photographed. Every 60th of a second, a picture appears on an alternate tube of a twin-tube receiver (above right) and is projected through its own polaroid filter onto a screen. A viewer with polaroid specs sees one picture with one eye at a time, but the brain holds the image and fuses it with the next one.



Switch Swallows Lightning

HERE'S a knife switch that can handle 330,000 volts or withstand the sudden power surge of a 1,300,000-volt lightning stroke. Biggest disconnect switch ever built by Westinghouse, it will isolate high-voltage lines for inspection and maintenance.

Ship Painters Roll It On

THEY'RE painting ships now just the way you paint a bedroom wall—with rollers. The 18-inch-wide rollers cover the surface fast, and long handles save the time needed to rig scaffolds. The high-pile lamb's wool is fixed to a Bakelite-impregnated core.

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Fire fighting rather than football enlivens

America's Biggest Engineering School

Illinois Tech is young but gigantic. You don't need a rich uncle, but it does take brains and hard work to earn your degree there.

By Martin Loveland

THE biggest engineering school in the U.S. is only 13 years old. Born of a union of much smaller schools, Illinois Institute of Technology for the last seven years has been turning out engineers faster than 193 other accredited schools to meet the country's serious shortage. Last year, Illinois Tech had 4,621 undergraduate and 920 graduate engineering students, topping Brooklyn Polytechnic, Purdue, M.I.T. and other renowned contenders.

It can no longer be confined to the

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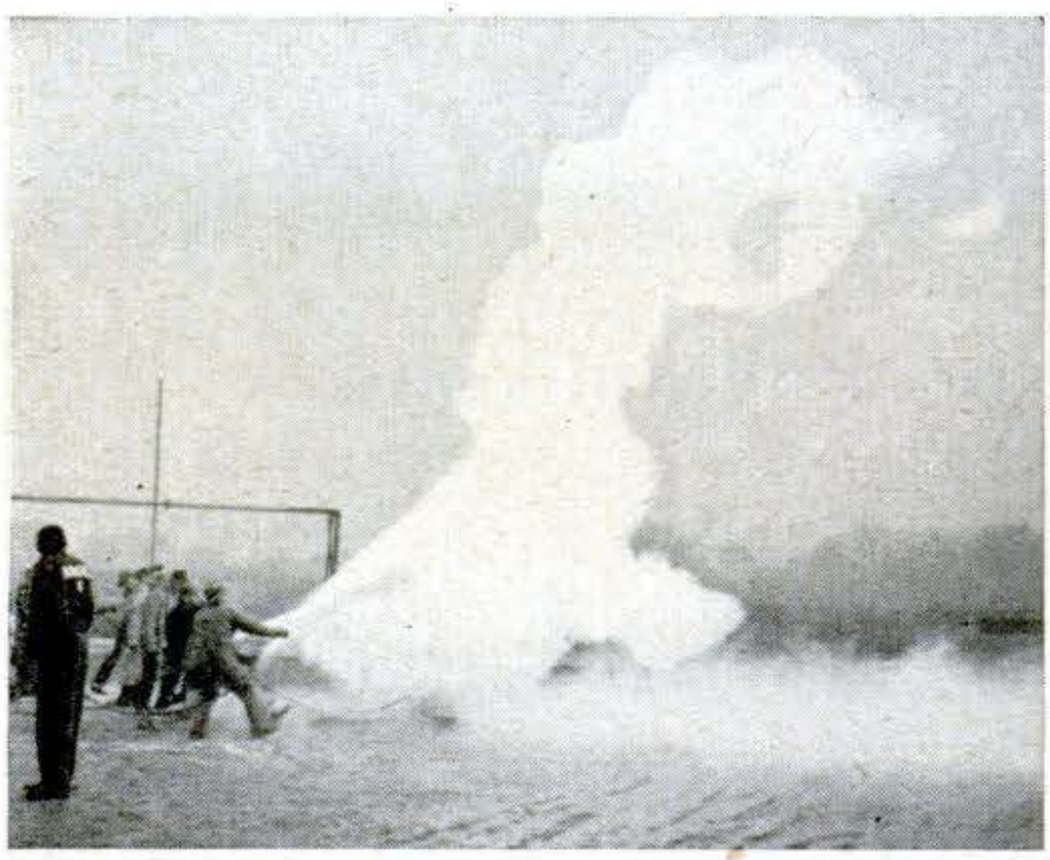
At Illinois Tech You Can Go to Blazes for Credit

Among the subjects in which Illinois Tech awards degrees is fire protection and safety engineering. The pictures below show students in the course on a field trip last spring to the Ansul Chemical Co., Marinette, Wis. They put out 75 sample fires in two days.

Teacher uses dry chemical against small fire.



Students douse flames of escaping propane.

Spray beats back gasoline blaze in open pit.

seven acres of Chicago's South Side where it began life in the broiling summer of 1940. There today a modern metropolitan college campus of 110 acres is being hewed out of a decayed area where desperately poor families are crowded into crumbling mansions that once belonged to meat-packing kings and railroad builders.

Buying room for the school to grow in and equipping it with new laboratories and classrooms and dormitories already has cost more than $10,000,000. To complete the school's grand plan, $20,000,000 more must be spent. Most of the land needed has been purchased. Fourteen of the buildings are already built and in use, with 48 still to come.

Night Owls Outnumber Day Students

Illinois Tech lies about 15 minutes south of the Loop by the fastest of several types of available transportation. Three-fourths of its students live in Greater Chicago and commute to classes. Two-thirds of them have regular jobs and go to school at night.

A high-school student who wants to go to Illinois Tech must be in the top half of his class and pass an entrance exam, but insufficient funds need not discourage him.

Two- and four-year scholarships are available in such unusual fields as fire protection and safety engineering, gas engineering, and food engineering. But most of the 400 day students who are receiving some kind of financial help are getting it through a special work-study program that Illinois Tech has arranged with 35 to 40 nearby industrial firms. Under this plan, a student attends school for a semester, then works for a company the following semester, thus earning all his college expenses as he goes along. Even at this pace, he can obtain a degree in five years and one summer.

The cooperative program at present is limited to students of metallurgical, mechanical or food engineering, but it probably will soon embrace those who intend to be chemical engineers, too. At least 50 companies, in addition to those

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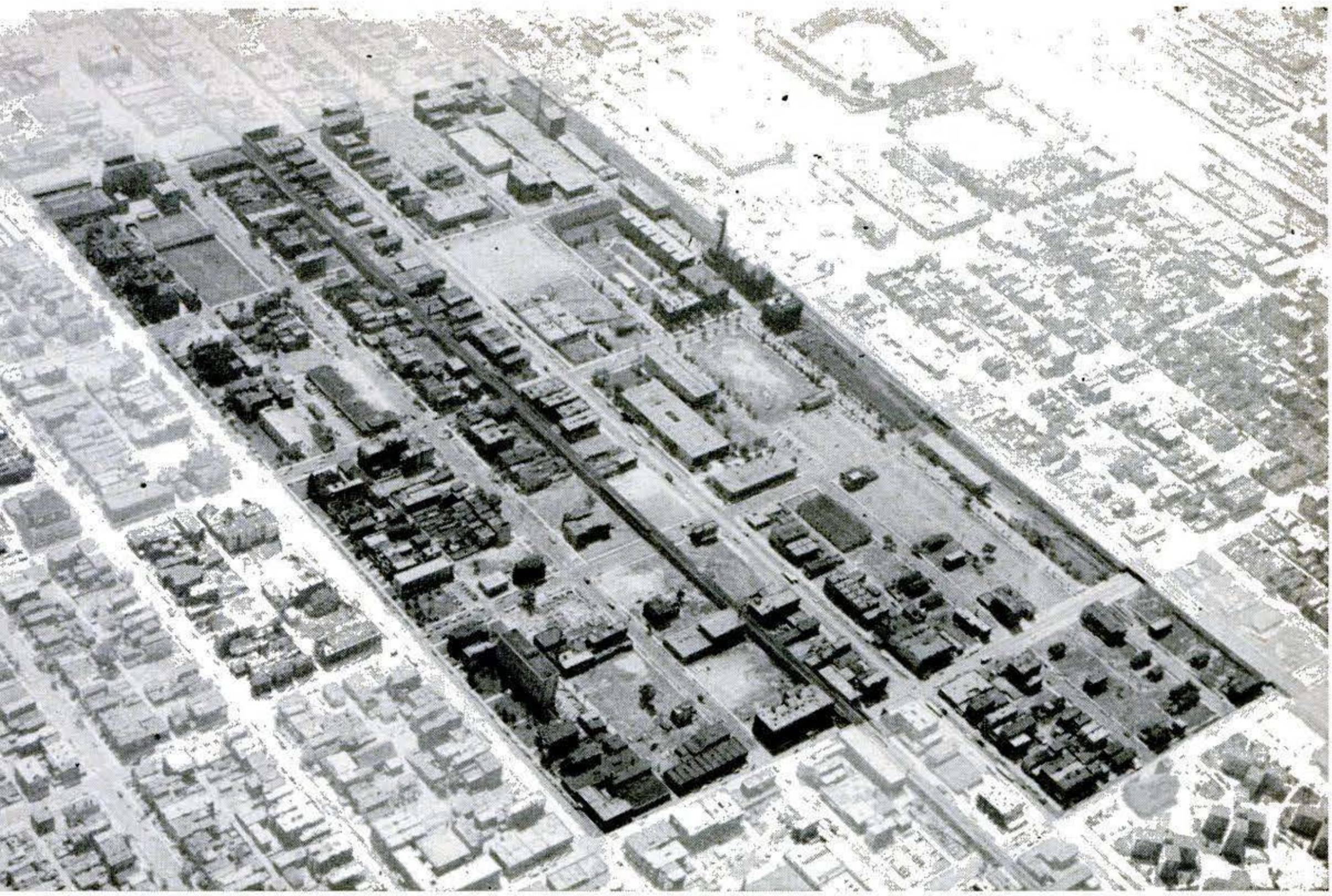

THE OVER-ALL PICTURE of Illinois Institute of Technology's setting in Chicago's South Side is seen here. Darker portion indicates the full extent of the forthcoming campus.

already in on the arrangement, are interested in joining up. The trouble is—an irony to anyone who went to college in the depression years—that there are far fewer students in need of spending money than there are sources of it.

400 Concerns Compete for Graduates

Graduates of the big Illinois engineering school also find themselves in green pastures. This past June, 400 industrial concerns competed for their services, at starting salaries averaging $350 a month. Interviews had to be arranged like doctor's appointments, and most graduates found what they wanted by the end of the seventh interview. What they wanted, incidentally, was primarily a job that interested them; salary rated fifth among the factors that helped them make up their minds.

Mechanical engineers are still in greatest demand, though the electronics, chemical and metallurgical industries are taking a constantly rising number of specialists in those fields.

As you might expect in a busy tech-

BETWEEN CLASSES, some future engineers have a hurried exchange of ideas in the sunlit lobby of the big technical school's new Metallurgical and Chemical Engineering Building.

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TAKING TIME FOR HORSEPLAY in the course of this year's Junior Week festivities, a group of Illinois Tech undergraduates engages in a coaster-derby obstacle race.

nical school, especially one that is expanding its walls as it pounds home logarithms and the laws of physics, sports have been neglected. Illinois Tech has no football team. Basketball is played in a temporary structure left over from World War II.

Tennis courts are being built on the campus this summer, but the baseball team still plays scheduled games in a public park, the swimming team holds meets in a boys' club pool a mile away, the rifle team shoots in a Naval Armory, and the track team runs against long-legged outsiders on a field belonging to the Chicago Board of Education.

Exams Bar Baseball Practice

"I suppose," says Bernard Weissman, a graduate lawyer and former member of the F.B.I., who is director of athletics, "that we're about the only school in the country where a kid says he can't make baseball practice because he's got an exam tomorrow.

"We can't make overnight trips because the kids can't afford to miss a lab. My track captain couldn't run in a crucial meet at Beloit this spring because he was being taken into an honor fraternity that afternoon.

"But if anybody ever invents a sport that can be played with slide rules, we'll put a team on the floor that will beat all comers."

Illinois Tech's president might easily be mistaken for a student. At 42, Dr. John T. Rettaliata is the youngest top official in any of the country's leading scientific schools. Trained at Johns Hopkins, tall, slim Dr. Rettaliata was a brilliant pioneer in the development of gas turbines.

On leave from an important research job for Allis-Chalmers in 1943, he was flown across the Atlantic in a commercial amphibian with its curtains tightly drawn, to investigate British progress in jet engines for the Bureau of Aeronautics. His survey, satisfactorily completed despite intermittent interruptions from the Luftwaffe, resulted in a report that was most useful in the improvement of our own early jet planes.

On May 8, 1945, before many Germans even knew the war was over, Dr. Rettaliata was flown into Germany to learn the secrets of the Germans' highly ingenious new hydrogen-peroxide submarine. The Germans had exploded a bomb in their full-scale cutaway of the submarine before the Allied scientists arrived. Dr. Rettaliata had little trouble, however, in figuring out how it had worked. His

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report, complete with detailed drawings and photographs, was a real war prize for the Bureau of Ships.

He worked for a time, too, as a consultant to Allis-Chalmers on the development of a nuclear-energy engine for submarines. And, for several months prior to his selection from a field of 75 candidates to become the second president of Illinois Tech in 1952, he was engaged in a high-priority project for the Air Force that is still secret.

Perhaps the most important and distinctive part of Illinois Tech is its Armour Research Foundation. Since 1936, when it began with three scientists and $40,000 worth of work to do, A.R.F. has conducted more than 7,500 research projects for 2,500 companies and the U. S. armed services. It undertakes to work out some of the trickiest civilian and military technical problems, strictly on a nonprofit basis.

Foundation Employs 1,100 Researchers

Today there are more than 1,100 scientists, engineers and nontechnical employees on the A.R.F. staff, and the Foundation is the second largest independent research center in the U. S. It is tackling nearly $10,000,000 worth of research a year.

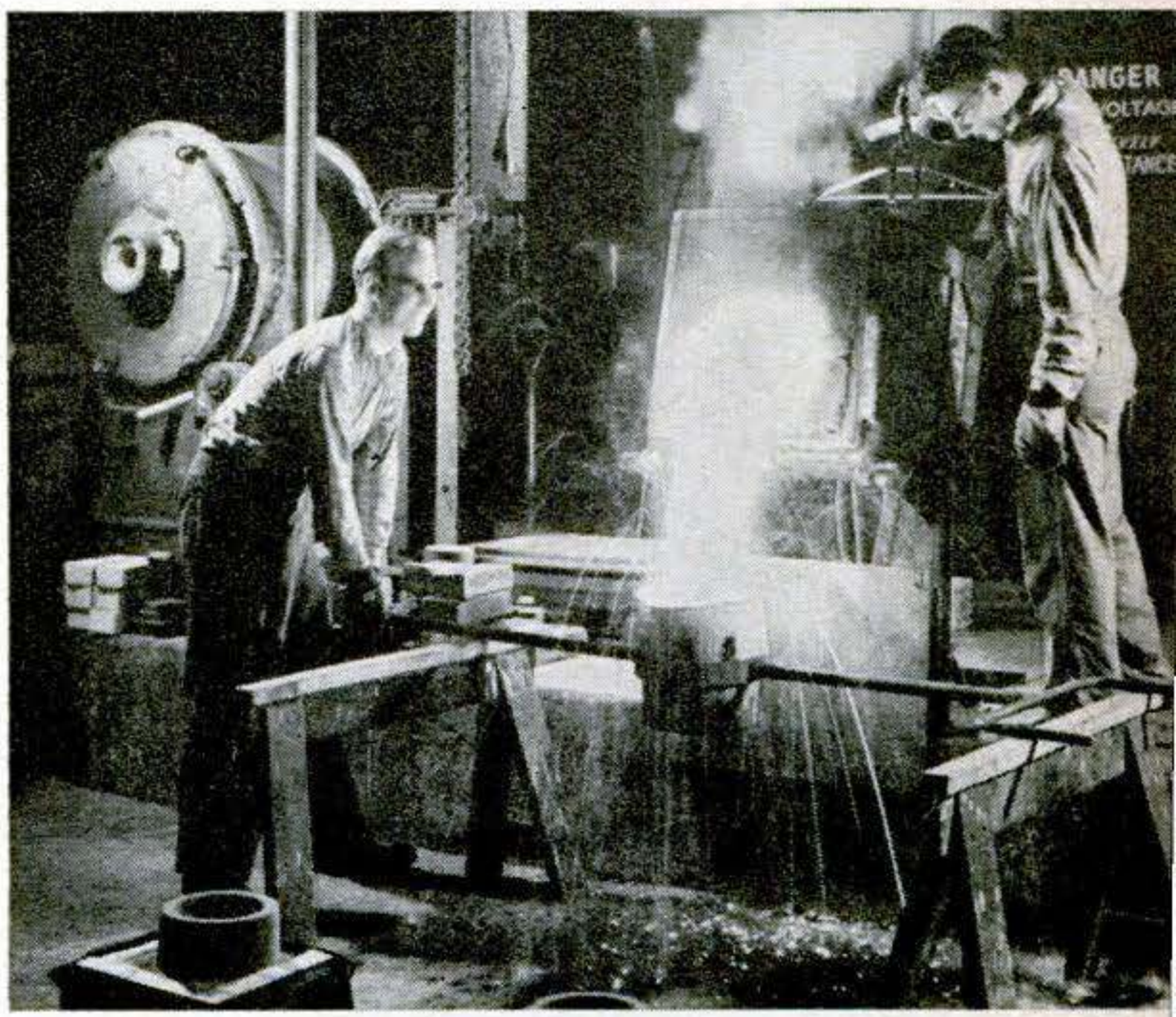
When International Harvester, for instance, wants to find a better repellent for rats, it engages this foundation. The A.R.F. has also helped a musical-instrument maker take the shrillness out of electric organs. It has developed a radiation detector for the Signal Corps, assisted a steel company in finding out how to make colored galvanized steel sheet, helped the Elgin people build an electronic watch.

Foundation experts are busy overseas, too. They are helping Costa Rica step up and improve the production of abaca fiber, assisting Pakistan to establish a steel industry, helping India find a good way to make newsprint out of bamboo.

Of the 19,000 alumni of Illinois Tech and its parent schools—Armour Institute of Technology and Lewis Institute—8,500

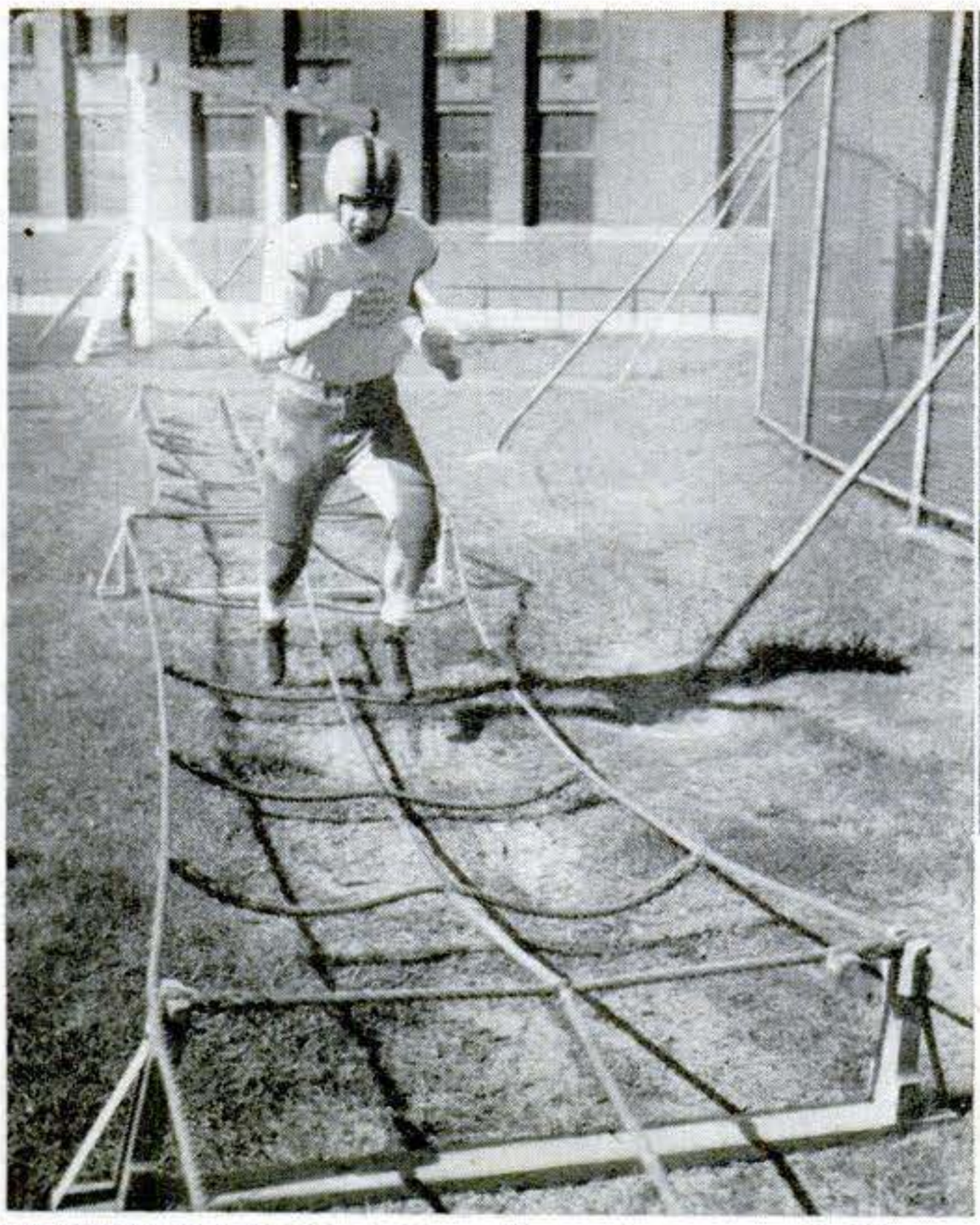
[Continued on page 246]

COLLEGE PRESIDENT AND FAMILY: Dr. and Mrs. John T. Rettaliata with Stephen (left), Patricia and Brian. Mrs. Rettaliata was a pathologist before she was married.

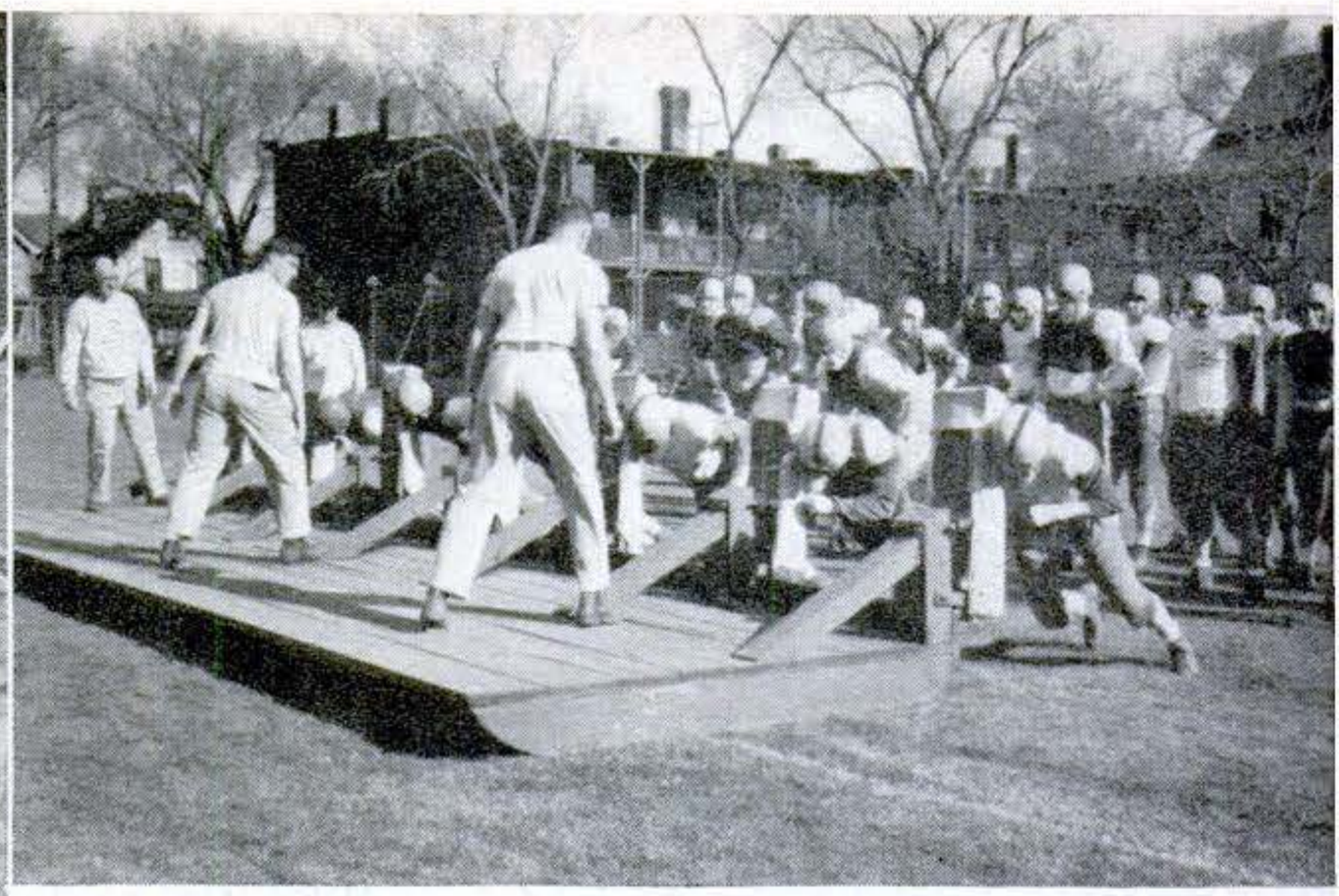


POURING STEEL AT 2,900 DEGREES Fahrenheit in Illinois Tech's famous Armour Research Foundation, which in 1952 did $8,106,000 worth of research.

A WOMAN ENGINEER, Lois G. McDowell, teaches thermodynamics at Illinois Tech. She is glad that other women, at her school and elsewhere, are studying to become engineers.



LEARNING THE ROPES, when they are laid out like this, is tougher than open-field running, Gophers say. Fancy footwork is acquired after many an embarrassing stumble.



IF THE BOYS CAN MOVE THIS 1,700-pound wooden sled with two hefty, jeering coaches aboard, no opposing human line is likely to stop them. Six players charge it at a time.

Gophers Train with Gadgets

Bench Warms Benchwarmers

FOOTBALL players on the sidelines don't warm this bench: the bench warms them. The sandwichlike slab is radiant-heated. The top half is of Heatcrete—a material of high thermal conductivity—with electrical-resistance wire embedded in it. Lower half is of concrete for insulation. The bench was devised by Lee-Don, Inc., Pittsburgh.

Two-Faced Stadium

INSTEAD of building two separate stadiums at $60,000 each, Grand Junction, Colo., built one grandstand to serve two playing fields at half the cost. Placed between a gridiron and a diamond, it seats 2,500 football fans on one side and 1,200 baseball fans on the other.

Raising one stand higher than the other left plenty of space beneath for dressing rooms and concession booths, and the cantilevered upper portion of the football stand shades the bleachers in summer. One control and press box atop the upper deck serves both fields. Smith, Hegner & Moore of Denver were the architects.

▶▶▶ A new football helmet, built around a shell molded of plastic and rubber, is said to give more protection to a conked noggin. Hard enough to take a heavy impact, resilient enough to absorb shock, it gives safety to the wearer without being a potential lethal weapon against an opposing player. The Wilson Athletic Goods Co., working with Goodyear, developed the helmet.

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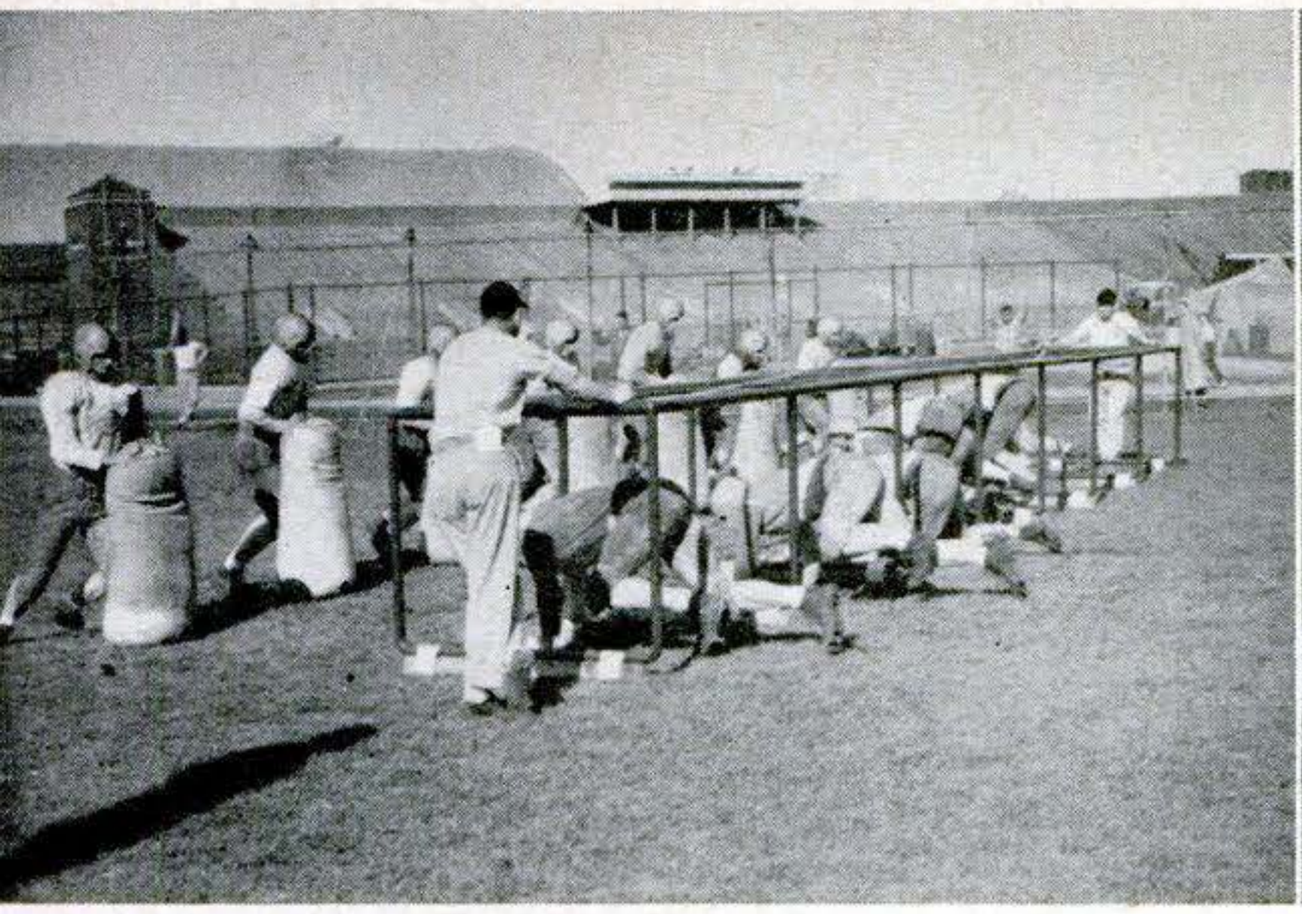
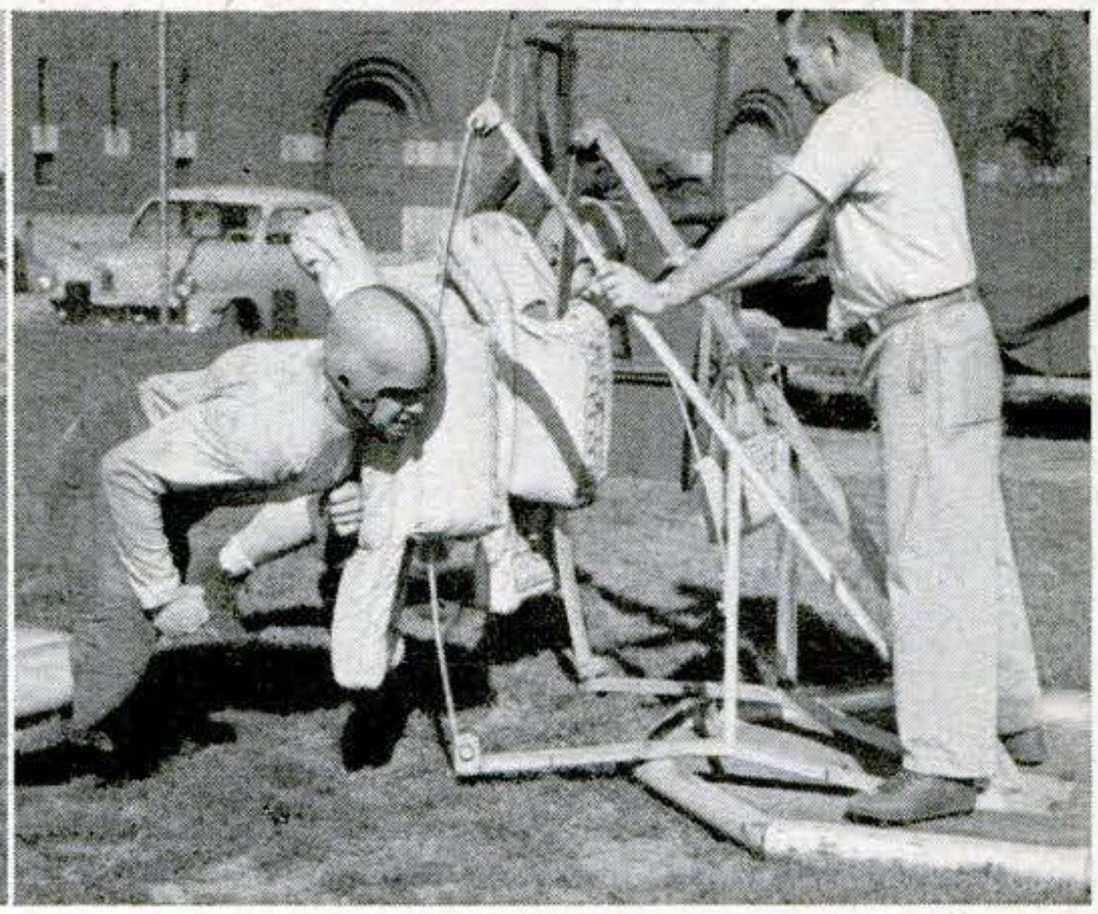


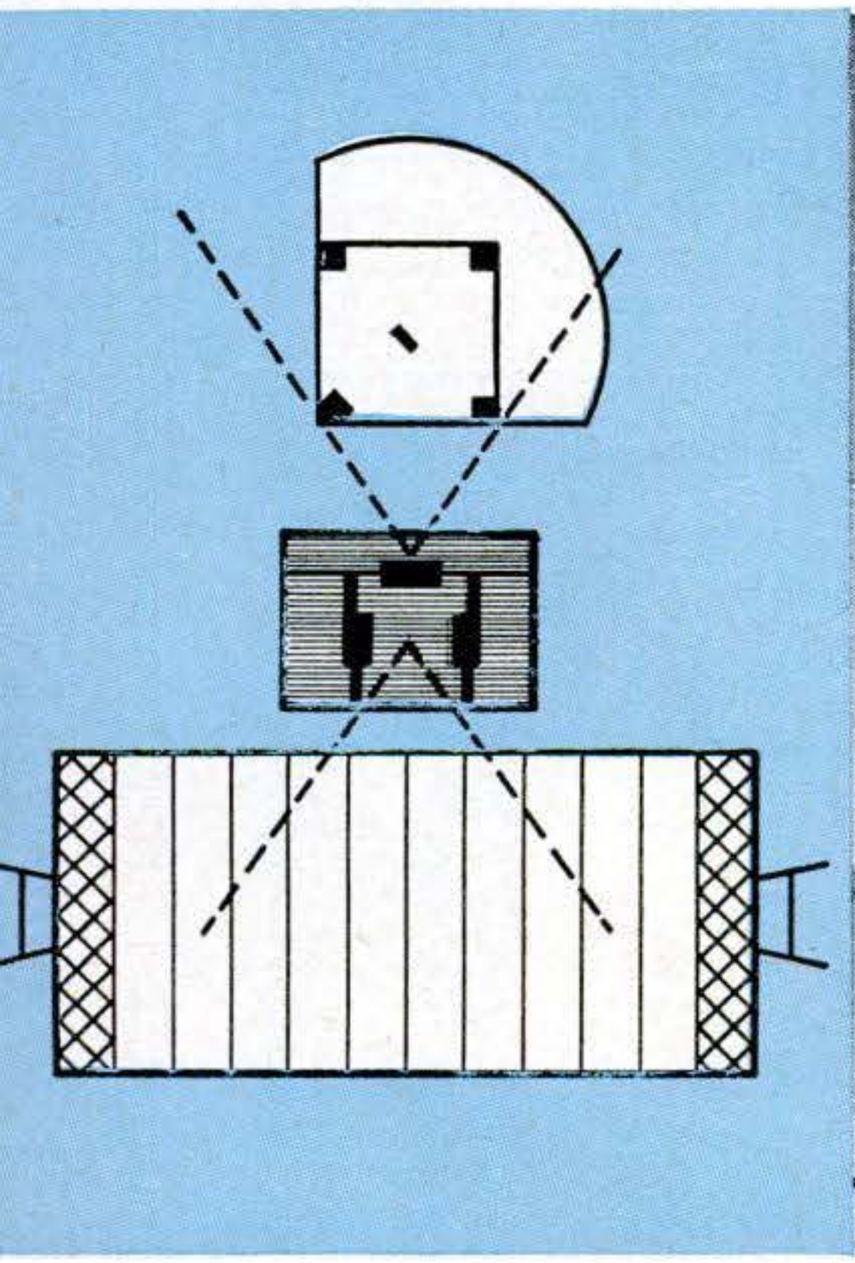
A BUMP ON THE BACK is assured for any high-tailing Gopher who forgets to charge low out of this seven-man cast-iron stall. It has a roof of crisscrossed piping, 3½ feet high.



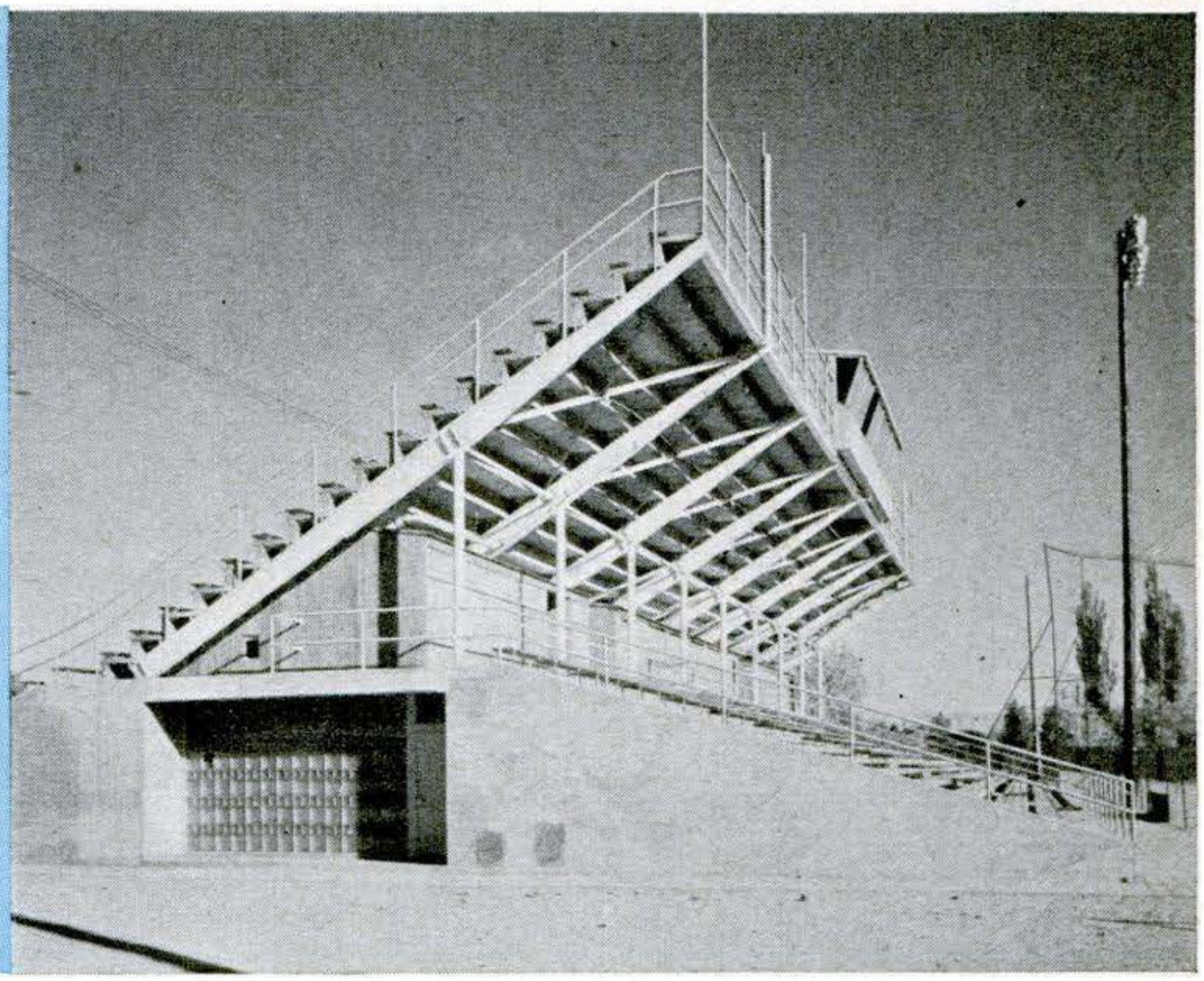
BLOCKING, TACKLING and straight-arming are taught with the padded-steel Crowther charger, which came from Penn State. A coach goes along for the ride to give individual help.

THE old-fashioned tackling dummy rarely gets a workout these days at the University of Minnesota. Wes Fesler, head football coach, has found that his Gophers can learn a lot more from tangling with gadgets of wood, rope, steel and cast iron. Four of the busiest training devices are shown on this page in photos from the *Minneapolis Star*. The charging stall (left above), originated at Nebraska, is raised on blocks. As training advances, the blocks are removed to make the players hit even lower.

Doubles for Football and Baseball Fans



DUAL-PURPOSE STADIUM is 129 feet long. Seats for 3,700 still leave 2,500 square feet for dressing rooms and vendors' stalls. The whole job took only 90 days, cost $16 a seat.



UPPER STAND JUTS OUT into space carried on cantilevered steel beams. Lower seats are concrete slabs cast on fill. Upper ones were precast as units, then bolted to the steel.

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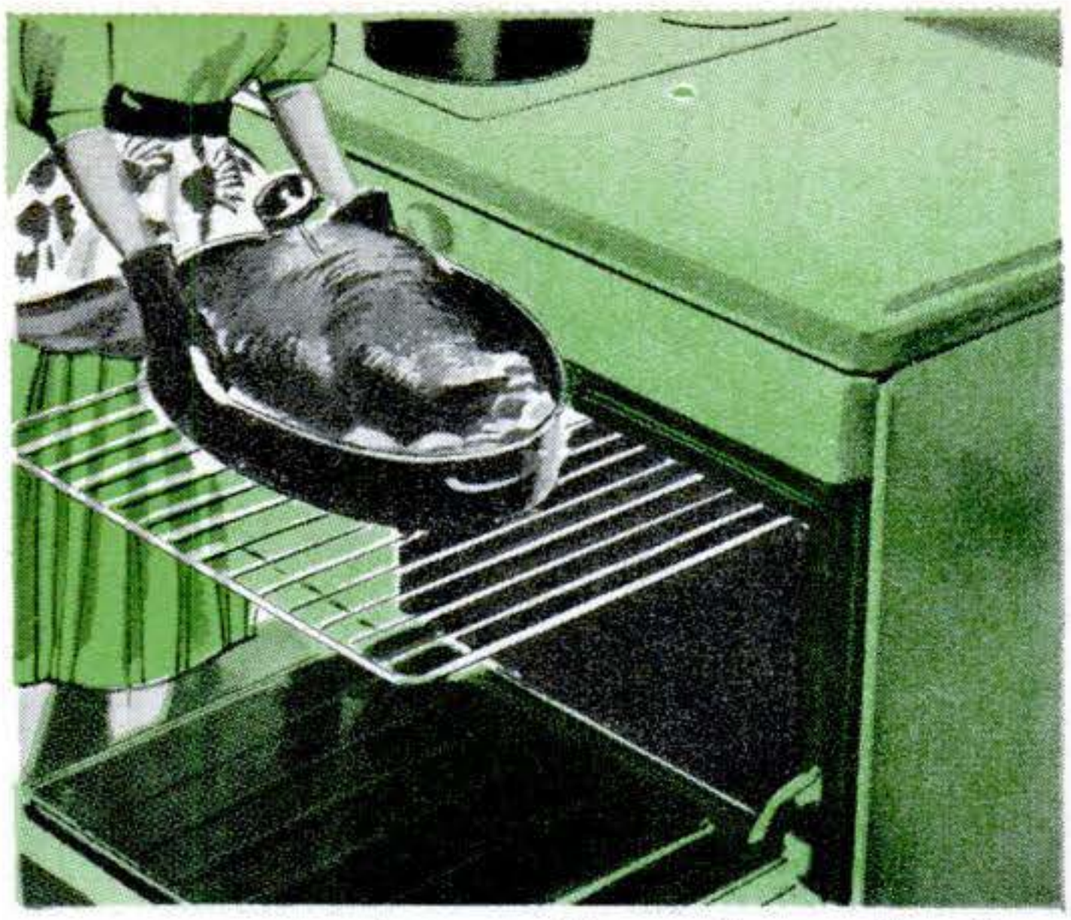
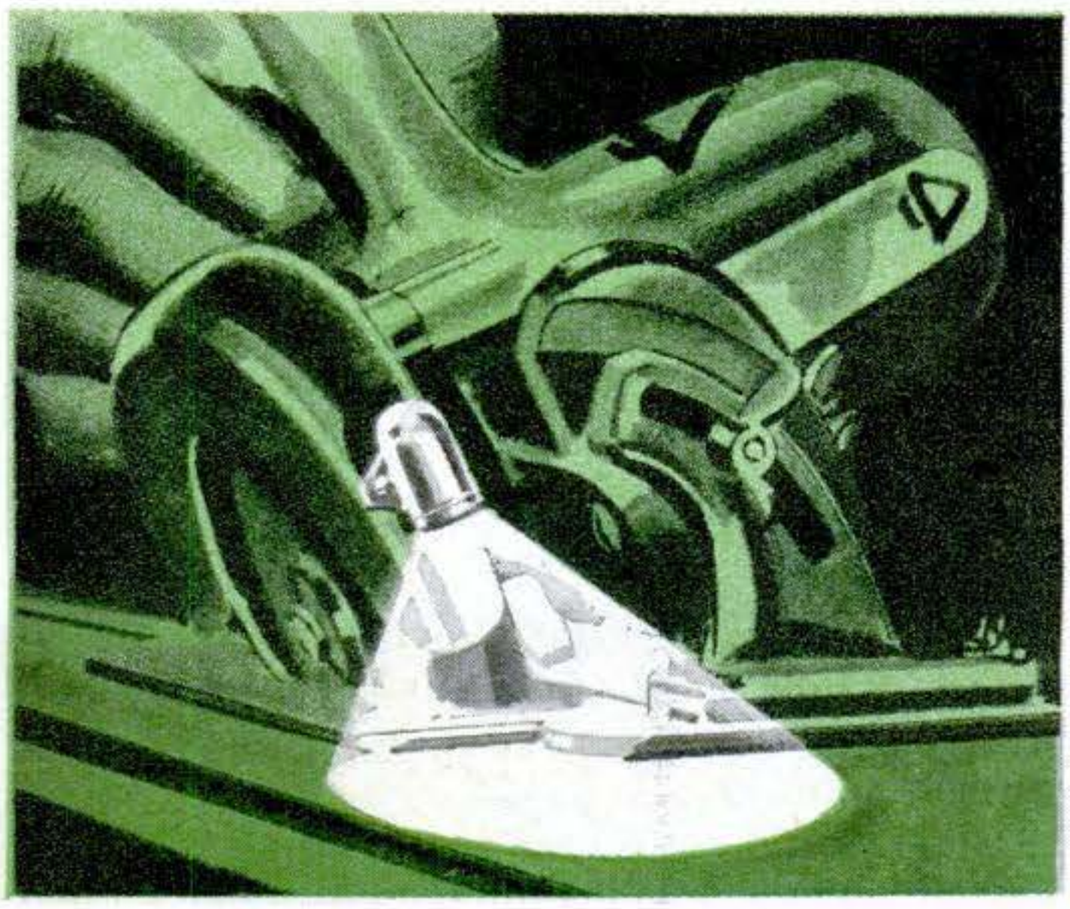
I'd Like to see them make...

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.

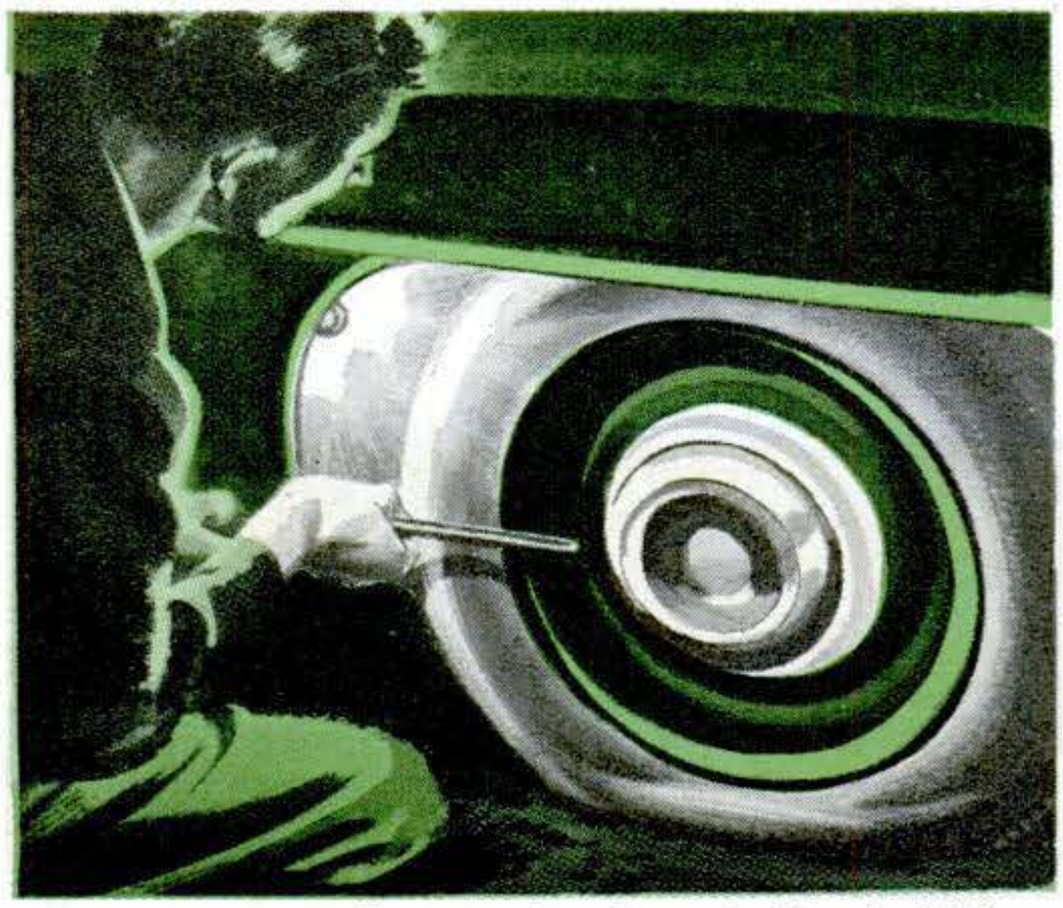


OVEN SHELVES that would pop forward and up to a no-stoop height when the stove door is opened, like a typewriter shelf in a desk.—*M. M. Strobel, Union City, N. J.*

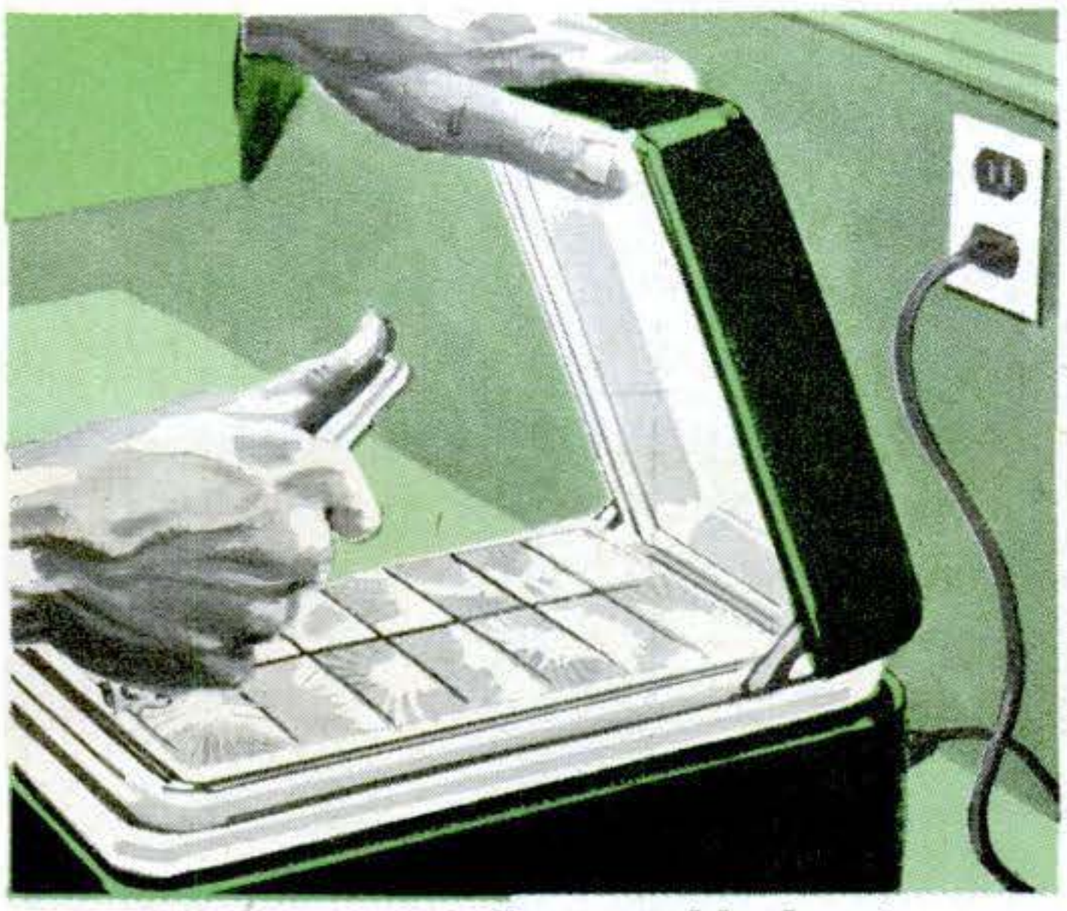
INTERLOCKING CANS for canned foods. If tops were humped and bottoms hollowed, it would reduce stacking time, prevent toppling.—*William P. Bohnet, Blackwood, N. J.*



AN ADJUSTABLE HEADLIGHT mounted over the guiding notch on electric handsaws so you could follow a hard-to-see guide line.—*John D. Bell, Provincetown, Mass.*



LIGHT BULBS under car fenders, behind sliding or hinged doors, so you could just switch on a light when you have to change a flat at night.—*Frank Froschauer, Bloomfield, N. J.*



AN ICE-CUBE MAKER that would plug into any electric outlet for use in motels or for making extra ice for parties at home.—*Mrs. B. C. Dickinson, Buena Vista, Ga.*

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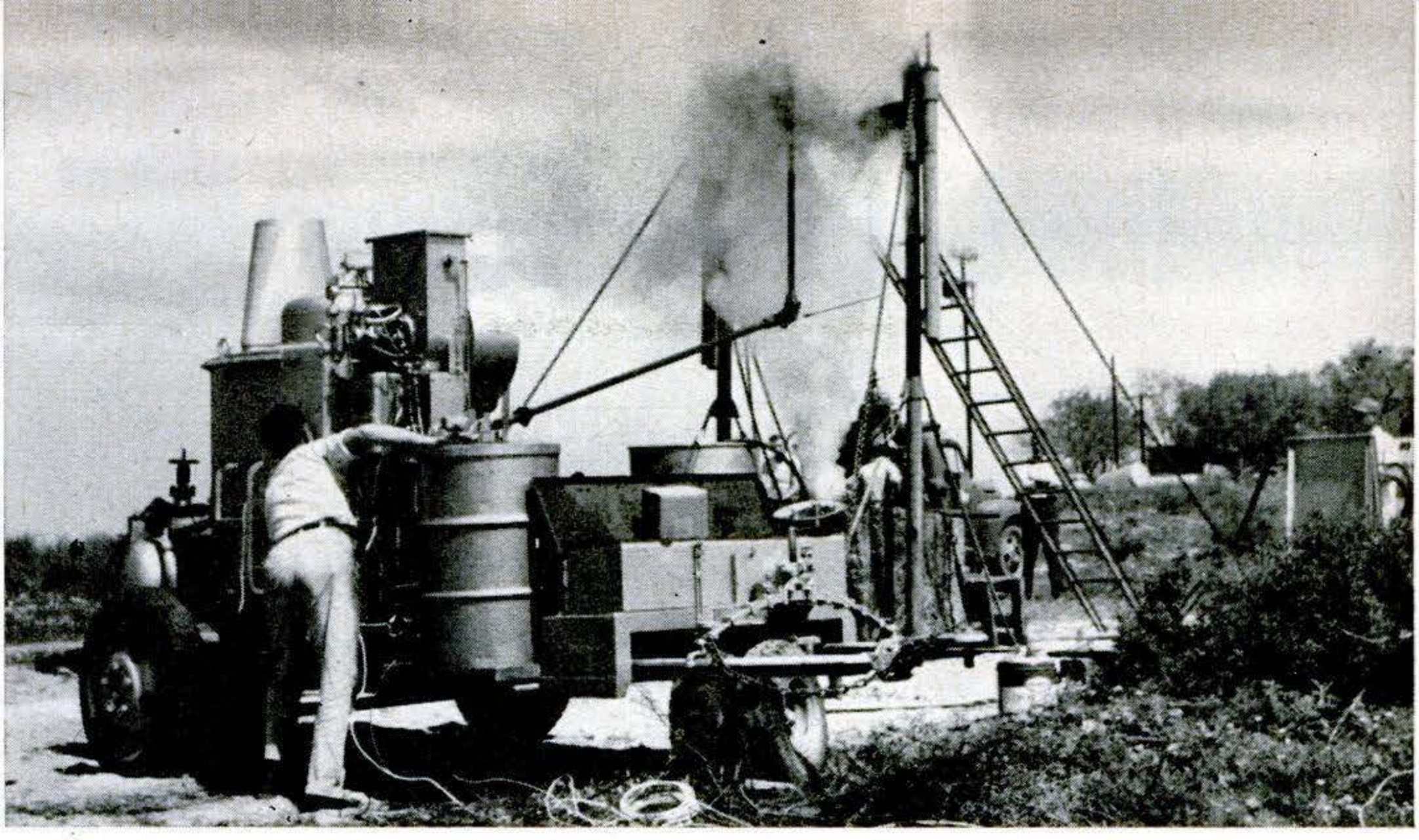
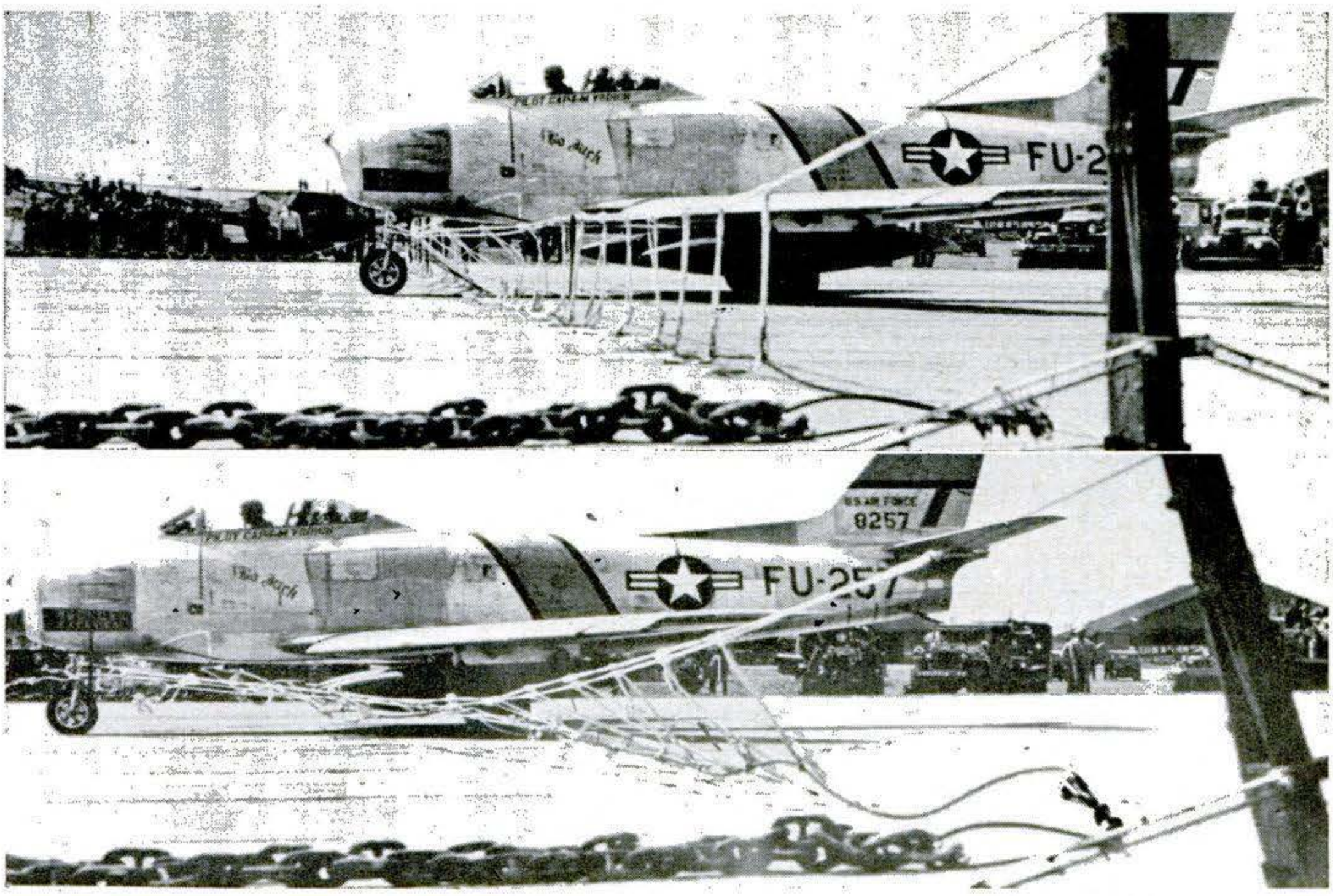


Steam Drill Eats Its Way Through Granite at Record Speed

UNDER 400 pounds of steam pressure, this percussion drill puts the bite on granite at a rate of 45 feet an hour—almost three times faster than the best previous method. Beating on solid-head bits, the drill makes up to 3,000 four-inch strokes a minute. Exhaust steam from the hammer piston carries away grindings. Ross Bassinger of San Antonio designed the drill, shown operating on steam from a Vapor-Clarkson generator.



Dry-Land Arresting Gear Grounds Jets Safely on Short Runways

F-86 Sabrejets now make safe forced landings in the limited length of emergency airstrips, using a dry-land counterpart of a carrier deck's arresting gear. Ten pilots and their planes have been saved to date by the apparatus, demonstrated above in Japan. A barrier like a tennis net, hit by a jet's nose gear (upper view), raises an arresting cable that snares the main landing gear (lower view).

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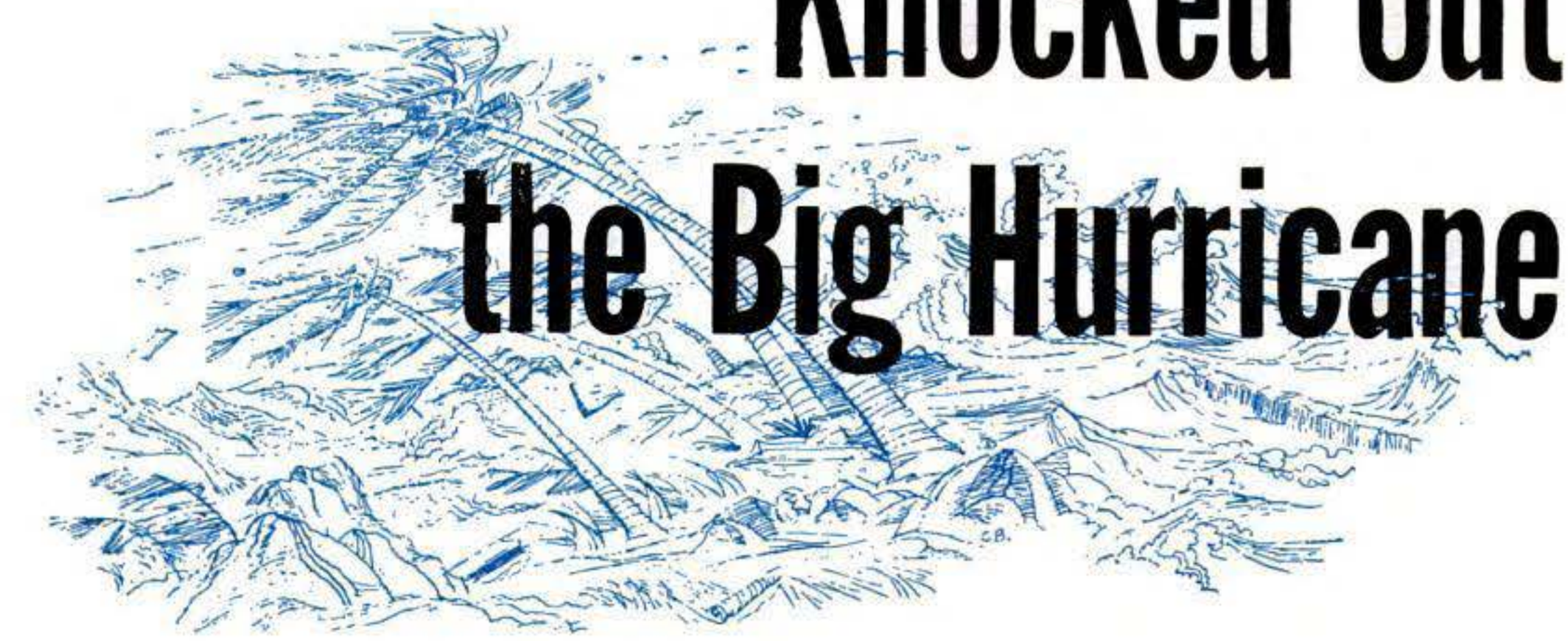
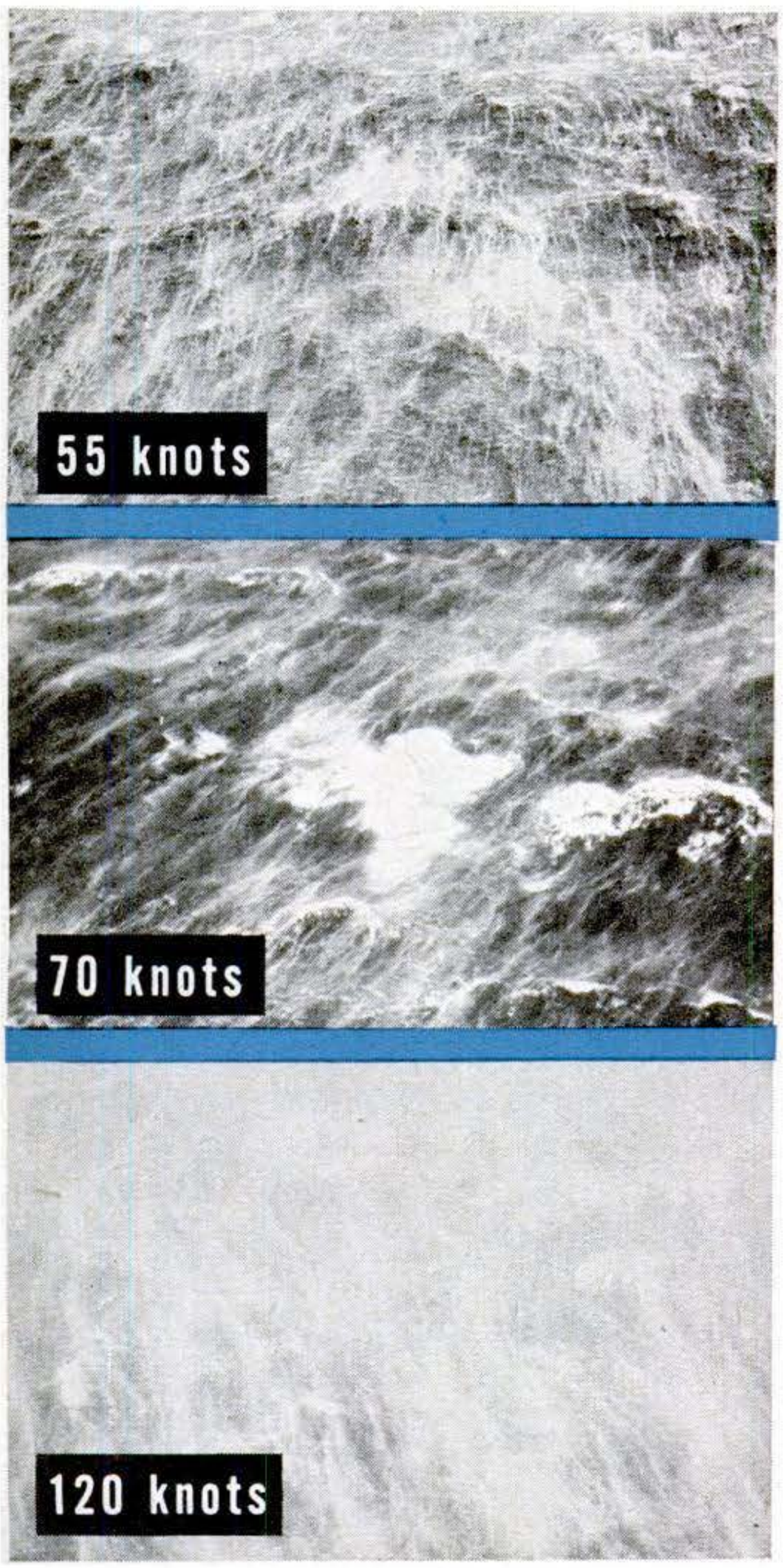
How the Little Hurricane Knocked Out the Big Hurricane





TELLTALE SIGN of hurricane's wind speed, to aerial observers, is aspect of ocean's surface. Here's how sea looks when whipped by winds of 55 knots (63 m.p.h.), 70 knots (80 m.p.h.) and 120 knots (138 m.p.h.). Wind speed above 125 m.p.h. turns it almost white.

Unique in weather annals,

By Ernst Behrendt

LATE in August 1951, or early in September—no one knows the exact dates—two great hurricanes were born near the Cape Verde islands off the west coast of Africa. They were both vicious killers. But one of them was destined to save thousands of lives. This is the story of how it happened, in the first collision of hurricanes ever recorded.

In due time the two hurricanes had received names, as do all that come to the notice of the U. S. Weather Bureau. The first one was named Easy, the other Fox. Both Easy and Fox were to play an unforgettable role in the history of Bermuda, 4,000 miles across the Atlantic from where they were brewed.

Brewing seems the right word to de-

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OBSERVERS FLY planes like this through eye of all but most violent hurricanes.

whirlwinds' providential collision saved a doomed island.

scribe the birth of a hurricane. The vast storm simmers for a long time in a heated cauldron before it is ready. Day after day the tropical sun beats down on the calm glassy ocean, till the water is warm, and the air above it hot and humid. Then, at one point a column of heated air rises. The rotating force of the earth twists the column into a spiral that slowly begins to spin. It may collapse, or be toppled over by the wind, or become stunted and end its life as a waterspout. Or it may grow into a hurricane.

Updraft Spells Danger

When Easy began stirring, one day, it cannot have looked too dangerous. At most, one would have seen a column of clouds twisting upward to a height of 25,000 or 30,000 feet. Easy was only a few miles across and it lacked about everything a hurricane is supposed to have: strong winds, torrential rains, huge waves. But it did have the one thing that makes a hurricane dangerous: a concentrated, tremendously powerful updraft. Possibly this column merged with two or three others like it, to form what was to become the strong central column —the heart, or "eye"—of the hurricane. At any rate, Easy did grow, as 37,000 frightened residents and vacationers on Bermuda were to testify eight or 10 days later.

Inside the spiraling central column, humid air was rushing up like smoke in a chimney. The higher the column rose, the stronger the updraft became, and the stronger became the whistling winds feeding warm, humid air into it. Heavy

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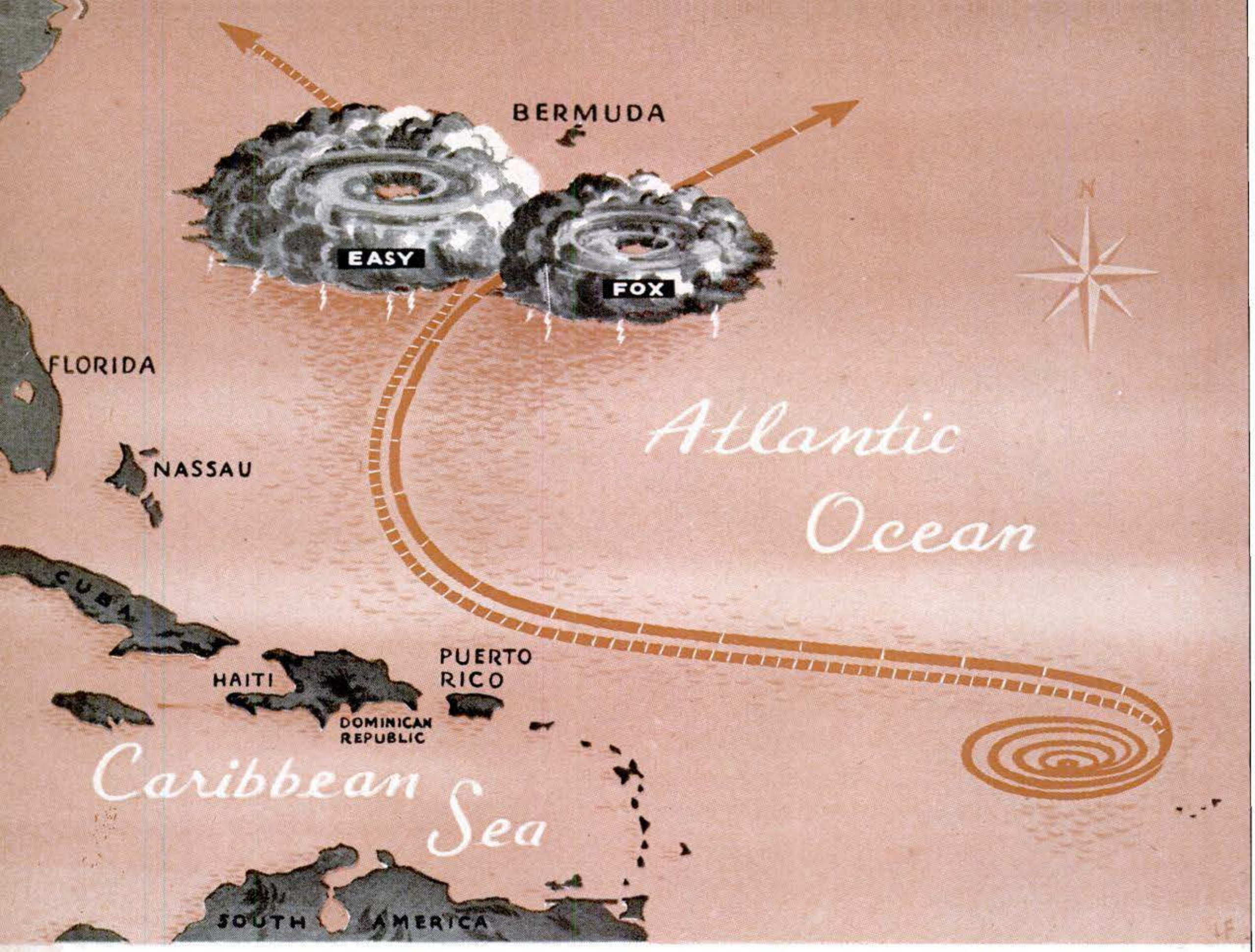

Drawing shows collision of big hurricane, Easy, and little one, Fox, that overtook it.

squalls churned the sea. Choppy waves grew into large breakers—and these into crashing 100-foot-high walls of water.

Having risen miles above the sea, the column was stopped—pressed down by a heavy layer of cold air. The top of the spiral was squashed and flattened. It mushroomed out and assumed a characteristic funnel shape. Viewed from above, Easy must have looked somewhat like a spinning phonograph record, with a hole—the eye—in its center. Where warm and cold air met, moisture condensed and rain fell. This was the first of the unending series of downpours that were to fringe Easy from the Cape Verde islands all the way to Bermuda. As rain was squeezed out of the air, the hurricane spun faster.

It was well on its way now—still growing, still sucking up the warm, moist air on which it lived and grew. It was rolling along at a fairly moderate speed, probably no more than 10 or 12 miles an hour; hurricanes never travel very fast. But the winds around its center were terrific. Even at this early stage they probably reached 150 miles an hour.

By the time Easy had moved along for about 1,000 miles, new columns of warm air began spiraling up in the Cape Verde doldrums. The cauldron was brewing a new hurricane. This one was to be named Fox.

Easy Was a Killer

Easy was first spotted far out in the Atlantic, about 2,500 miles off Florida. The storm was then about 500 miles wide. Weathermen immediately recognized Easy for what it was: a hurricane of the worst type, a killer, one of those truly disastrous storms which occur maybe once every three or four years.

At this point some people suggested, "Let's explode an atom bomb in front of

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Easy. Surely the power of an atomic explosion will make the hurricane change its course." But an atomic explosion would do no such thing. A hurricane packs the power of hundreds of atom bombs.

Flying into the Storm

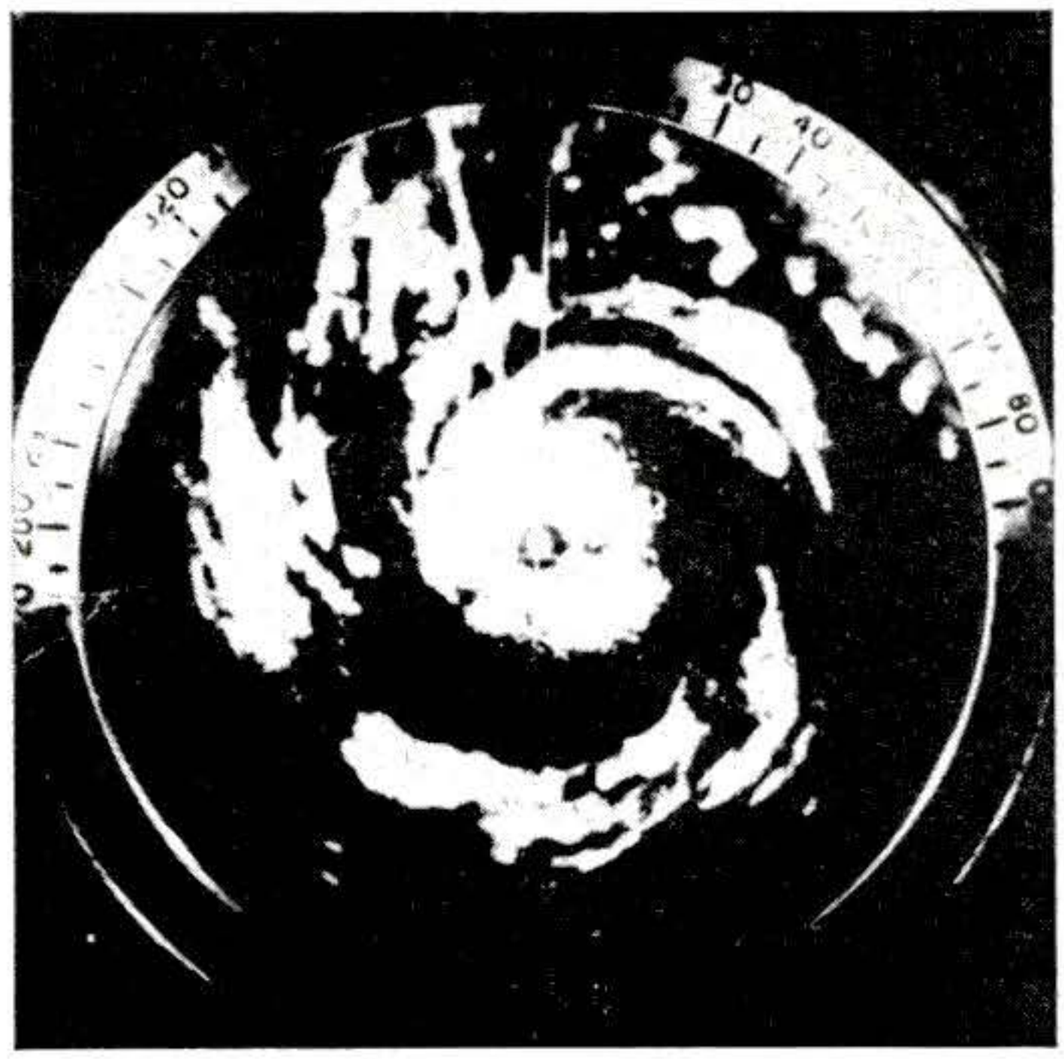
It was vitally important to gather all available information about Easy and dispatch warnings. The accepted procedure for the first job is to send a plane staffed with experienced meteorologists into the very center of the hurricane. During their flight they send radio messages on what they encounter: wind velocity, rain, barometric pressure.

A four-engine plane was sent out to investigate Easy. The plane bored into the hurricane from below. From an altitude of less than 1,000 feet, trained observers watched the pattern of the waves, reading from it the speed and direction of the wind.

As the plane approached the fringe of the storm, the observers first saw whitecaps, which meant that winds were blowing at 30 to 35 miles per hour. A little later green spots appeared on the whitecaps: 40 miles. The green spots grew larger: 60 to 65 miles. White streaks across the waves: 80 miles—90 miles—100 miles. The ocean turned almost white: 125 miles.

Heavy rains were pelting the plane. At noon the sky turned black. 130 miles. Dead ahead, "prongs" appeared: spiral bands of wind converging on a center, an indication that the eye was not too far ahead. 140 miles. The plane was taking a fearful beating. Some of the men were sick. 150 miles. Vicious vertical winds were jerking the plane up, pushing it down almost into the spray of the 100-foot breakers. As Easy clawed at the plane, the radar operator went on reporting every five minutes on wind direction and velocity.

When the operator said, "160 miles," there was one thought only in every man's mind: "Will the wings hold?" Then the operator called out the unbelievable figure of *175 miles an hour.*



EYE OF A HURRICANE looks like this in radarscope of a plane flying high overhead. Picture on screen clearly shows the typical spiral formation of clouds.

They were only about 15 miles from the "eye," the calm center of the storm, when the pilot had to call it quits. The plane turned back. That decision probably saved the men's lives. They would never have gotten through the almost solid wall of wind and water surrounding the eye. (On October 27, 1952, a B-29 weather plane with a crew of 15 disappeared and probably disintegrated near the eye of a typhoon lashing the Philippines.)

Floridians Alarmed

People along the coast of Florida were alarmed, and their alarm was justified: the striking power of 175-mile-an-hour wind is almost beyond imagining. (The winds of the great Galveston hurricane that killed 6,000 people in 1900 probably did not exceed 90 miles an hour.)

The Florida watchers also worried about Fox, which was now reported to be tagging along 1,000 miles behind Easy.

Suddenly Easy shifted its course. At a point north of Puerto Rico, it veered north. New storm warnings went out. Weathermen replotted Easy's course. There was no doubt: the killer hurricane was headed north in a huge arc that would take it straight through Bermuda.

Twelve hours later, Fox, gaining speed

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all the time, reached the spot at which Easy had turned north, and did exactly the same thing. Like a bloodhound following a track, the smaller hurricane clung persistently to the path of the big one.

People in Bermuda were paying hardly any attention to Fox. They were concerned only with Easy. Ships in the hurricane's path fled out of range. The U. S. Air Force pulled its planes out of Bermuda. In Hamilton, the capital, as elsewhere on the islands, people were boarding up homes and hotels and shops, though doubtful of how much protection this would give against winds now clocked at 200 miles an hour.

Disaster One Day Off

On September 8, the barometer started to fall rapidly; the killer hurricane was less than 24 hours away. Disaster seemed certain. Then a new bulletin was flashed: "Baby hurricane headed for collision course."

The "baby hurricane" was, of course, Fox—a monster by any standard except the one set by Easy. The two hurricanes now were only hours apart. On Bermuda, tension increased. "Collision course"—what did that mean? Could hurricanes actually collide? If so, what would happen? Would the winds of one reinforce those of the other? Would Fox add its 120 miles an hour to Easy's awful 200?

The meteorologists came up with a surprising theory. They had no record of an actual collision between two hurricanes, but they reasoned that hurricanes are like tops spinning in the same direction. When two tops bump into one another, they move off in opposite directions.

By early morning, September 9, Easy's winds were striking ferociously at Bermuda. At five a.m., the winds had reached speeds of 45 to 50 miles per hour. This was not yet the real hurricane; "hurricane force" begins at 75 miles per hour. But the time was not far off.

Winds of true hurricane force were only 10 miles away from Bermuda—with

[*Continued on page 280*]

in SEPTEMBER for

hurricanes. A tornado (PSM, April '53, p. 187) wreaks tremendous damage in a pinpoint area. One single hurricane may churn up half the North Atlantic Ocean.

REMARKABLE progress has been made by the Weather Bureau's warning system. Follow those warnings. If you are in a small craft when storm warnings are hoisted, get into harbor. If you are ashore, get indoors and stay away from windows. Keep the radio on and follow its advice. Drive away from the area of a hurricane, if you have advance warning. **Do not mistake the cloudless, calm center of a tropical hurricane for its end. In one Florida tragedy, many persons lost their lives because they went outdoors too soon and were caught by the hurricane's second half.**

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Four-passenger D.K.W. develops 34 horsepower at 4,200 r.p.m., will do 70 miles an hour.

Three-Cylinder Car as Smooth as a Six

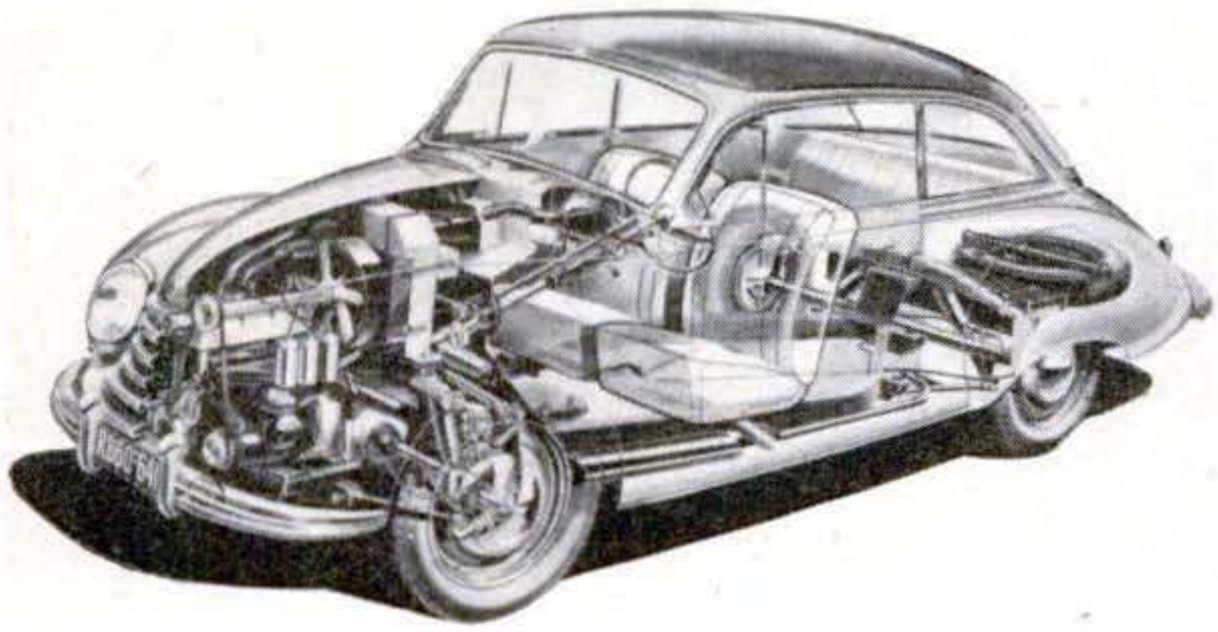
A THREE-CYLINDER automobile that runs as smoothly as a six is being made in Germany. It's smooth because the engine is a two-cycle—with a power impulse on every second stroke.

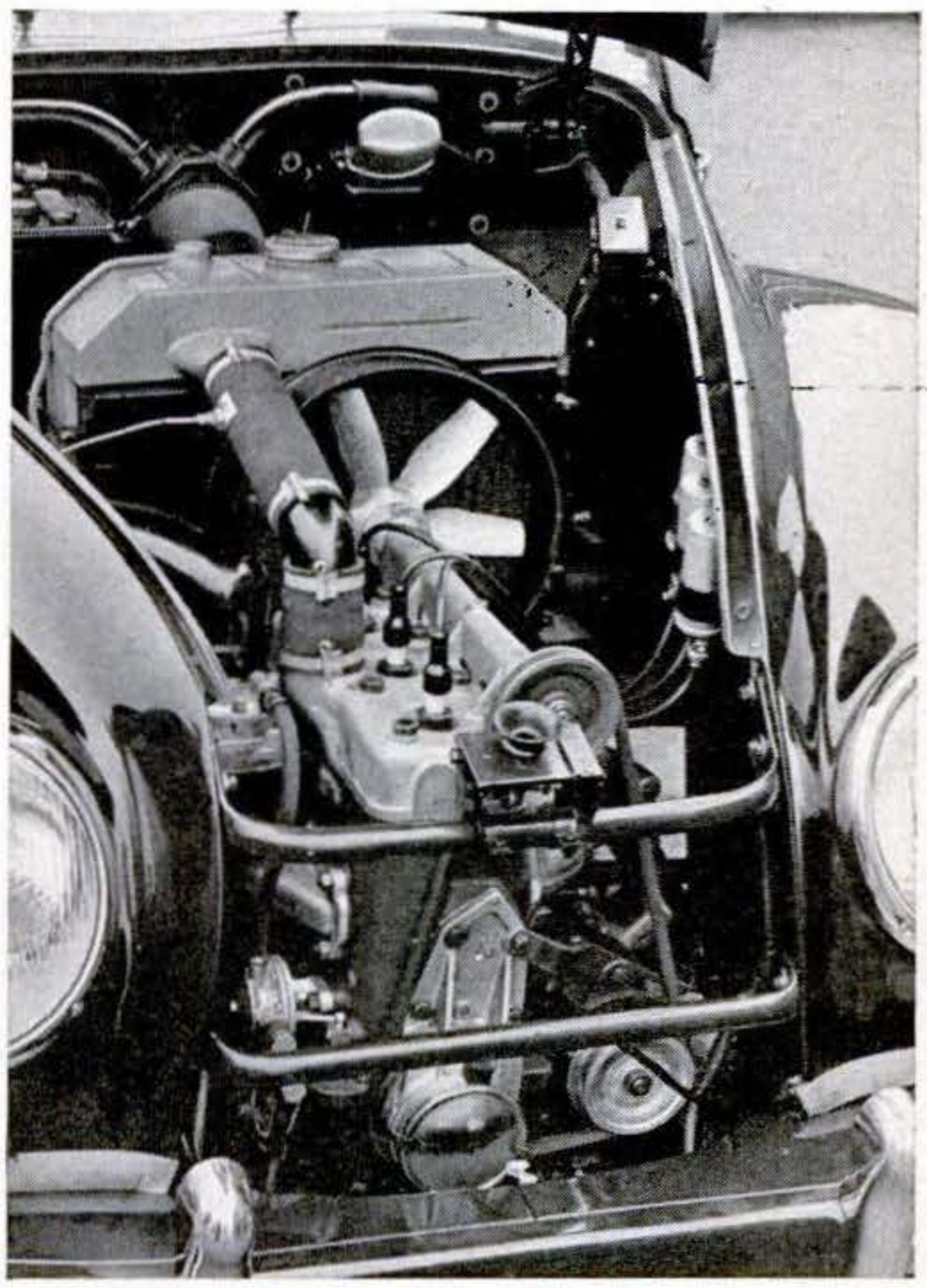
Known as the D.K.W. "Special Class" model, the car produces one horsepower for each 1⅝ cubic inches of piston displacement. For comparison, the newest of Chevrolet's six-cylinder engines produces one horsepower for each two inches of displacement.

Like a marine outboard, the three-cylinder engine has exhaust and intake ports in the cylinder walls. The piston uncovers them at the bottom of the power stroke. The lubricating oil is mixed with the fuel at a ratio of 1:20. The fuel is piped to the crankcase and forced into the cylinders by the pressure build-up in the crankcase as the pistons come down.

Each of the three spark plugs has its own coil. From a primary circuit, distributor current is passed through the coil, changed to second-current voltage and fed to the plugs.

The engine delivers almost 28 miles to the U. S. gallon of gas.





RADIATOR AND FAN, run by extension shaft on top of block, are at rear of engine. Cutaway at left shows installation of front-wheel drive unit and absence of floor tunnel.

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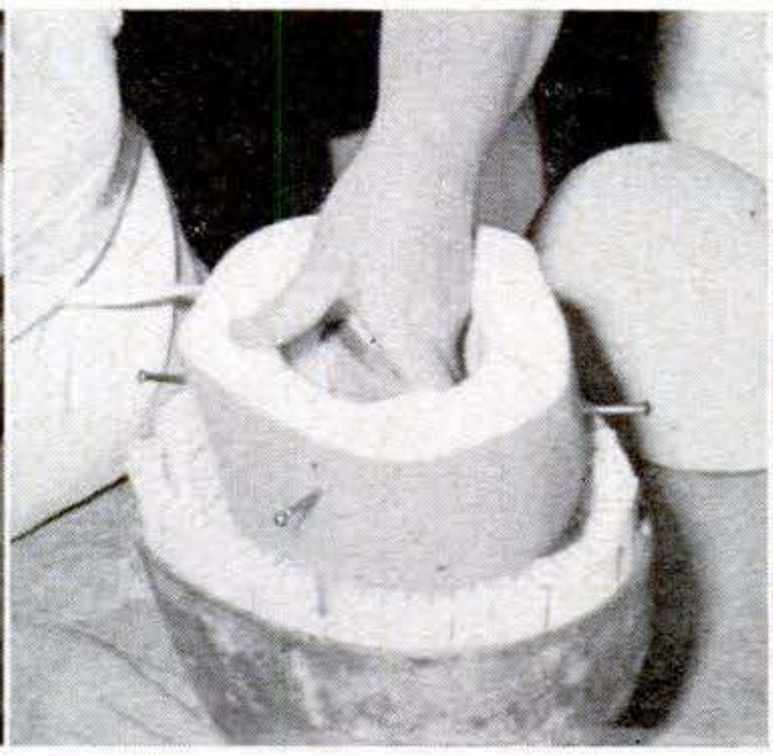
Fastest Flier Gets Fitted for

1 FIRST STEP in making de luxe safety helmet is shaping a heat-softened wax shell to contours of flier's head.

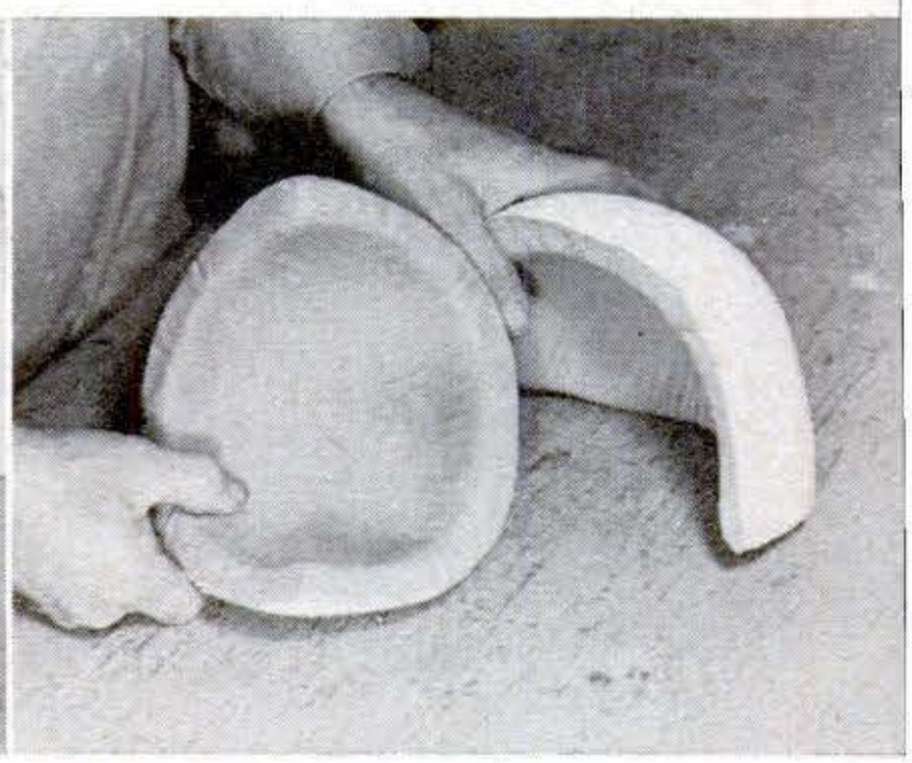
2 PLASTER poured into wax mold forms model of his head. Hatter's task is somewhat like that of a sculptor.

3 HARDENED PLASTER "HEAD" is ready to remove from mold, to serve as flier's stand-in for shaping helmet liner.

5 FOAM RUBBER, poured onto the cellulose acetate in the bowl, makes a cushioning interior layer for the liner.



6 WITH PLASTER HEAD MOLD set in gooey rubber, as above, bowl of liner material is ready for curing in oven.



7 SLICED IN HALF after curing, and with suede-leather covering inside, liner will fit into Fiberglas-and-resin shell.

They Say Now.....

PROF. BERNARD COHEN OF HARVARD: *"To those who make the most intelligent scientific guesses we give Nobel prizes."*

DR. ROBERT GESELL, UNIVERSITY OF MICHIGAN MEDICAL SCHOOL: *"The speed and streamlining of the mackerel, the jet propulsion and smoke screen of the squid, the echo locator of the bat's radar system, the physical bulldozer power of the rhinoceros, all of which were built into the substance of these creatures by hundreds of millions of years of evolution, have within recent years become available to man as artificially acquired equipment for living or fighting."*

EDWARD R. MURROW, CBS-TV REPORTER: *"My father always thought there was something doubtful about making a living merely by talking."*

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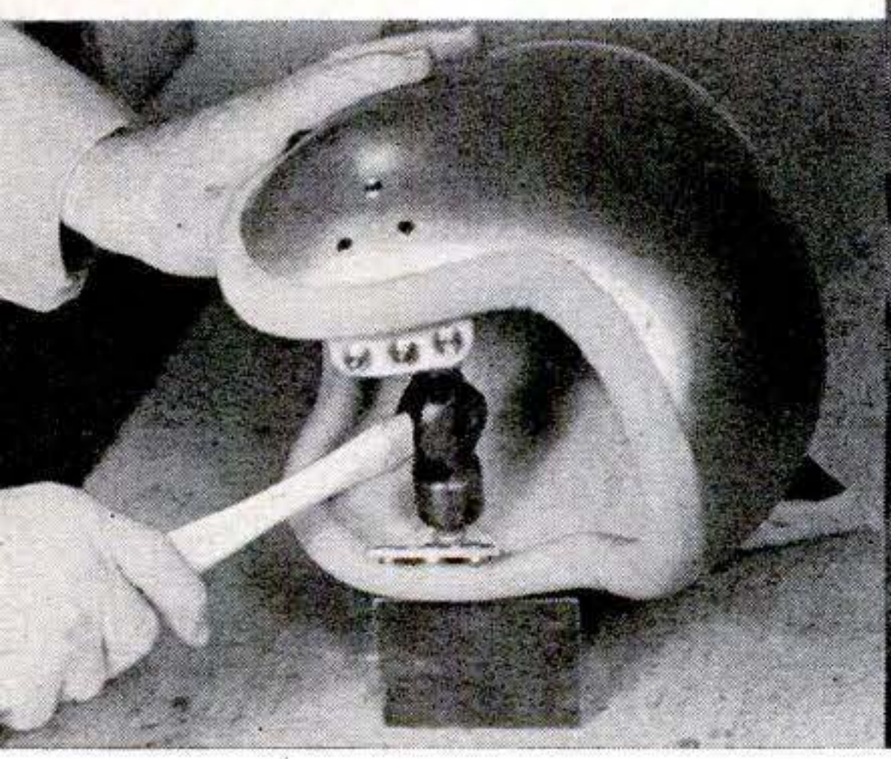
$215 Hat

4 SHOCK-ABSORBING cellular blocks of cellulose acetate, placed in bowl, make up liner's exterior layer.

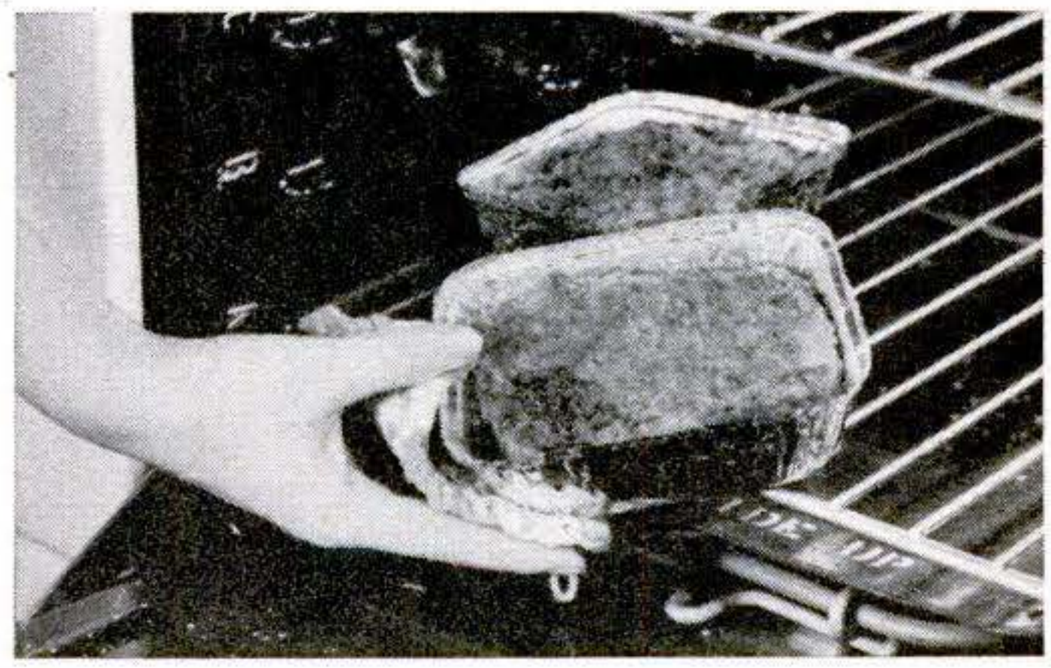


8 OXYGEN-MASK TAB is riveted to lined helmet—tough as steel, soft as silk, excluding all sound but radio.

9 BILL BRIDGEMAN, who's flown 1,238 m.p.h. in Douglas Skyrocket, dons a finished Toptex crash helmet. In an accident, it could absorb a terrific blow harmlessly. Custom-made by Protection, Inc., Inglewood, Calif., each helmet costs $215.

Shoes Put Bounce in Your Step

STEP out in these shoes, and you get a smoother walk and a helpful push ahead. Soled with wavy gum rubber, sports and walking shoes spring up and ahead when stepped on. There are special models for wounded vets.



Cook—and Throw Away the Pot

ALUMINUM-FOIL baking utensils (above) save a lot of pot scrubbing. You can bake food, cover it and freeze it, and later reheat it—all in one pan. Said to be cheap enough to throw away after use, Ekco Foilware can, however, be cleaned over and over again.

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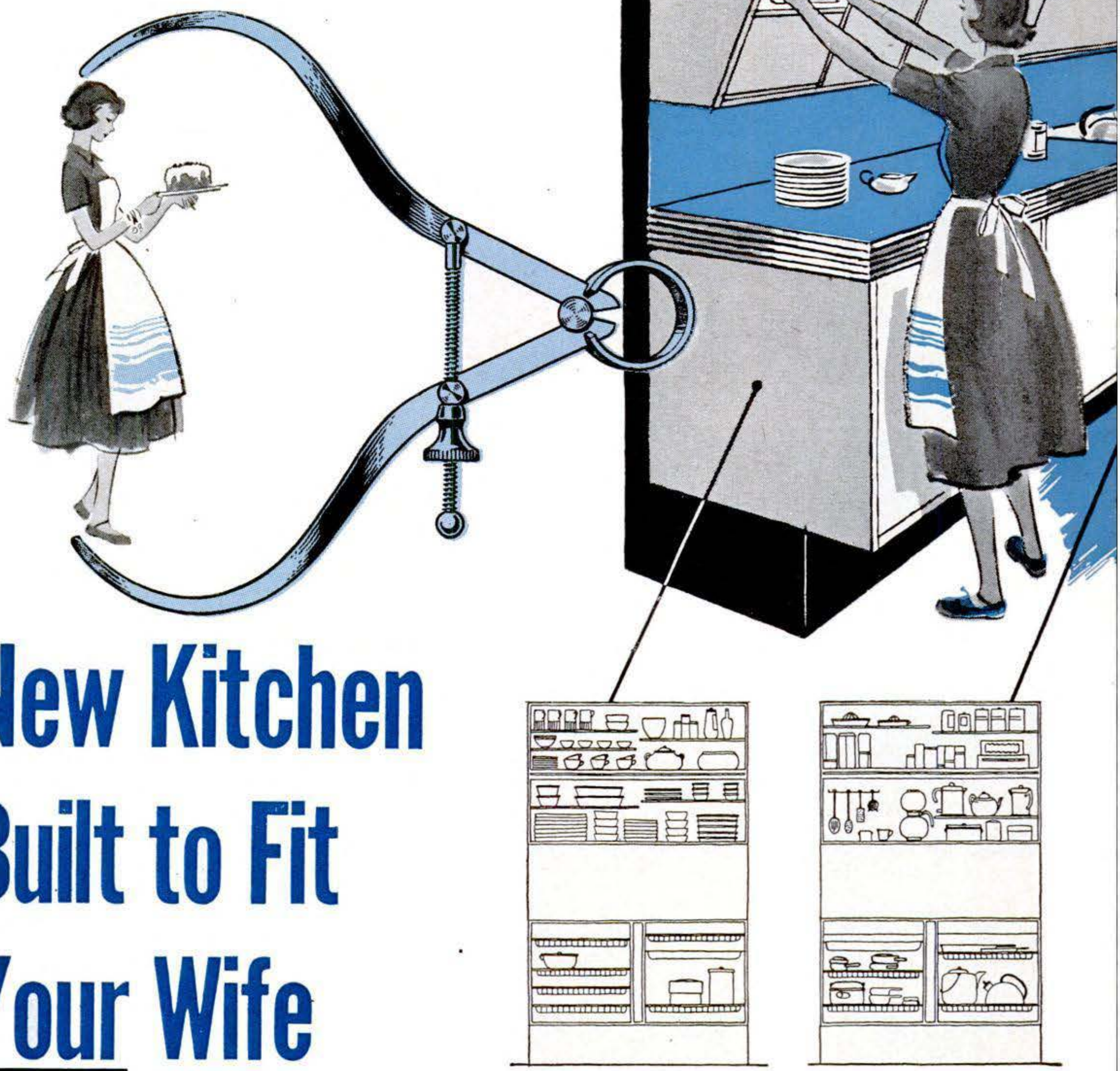
Tall, short or medium-sized, she's bound to save energy in this kitchen.



New Kitchen Built to Fit Your Wife

SERVE CENTER stores china, glasses, silver and linen where they are close to the dining area, located at right above.

RANGE CENTER has four electric burners and their controls set into a counter top. Wiring for the range is built into the cabinet.

By Gardner Soule

BUILD the cabinets to fit the woman. Build the shelves to fit the supplies. Build the kitchen to fit the family. Starting with these three principles, Cornell University has re-engineered the most-used room in the house.

The result is a kitchen equipped with:

- Cabinet counter tops that are adjustable—even after installation—to fit a woman of any height, or arm length.
- Shelves or other provision for storing all food and equipment.

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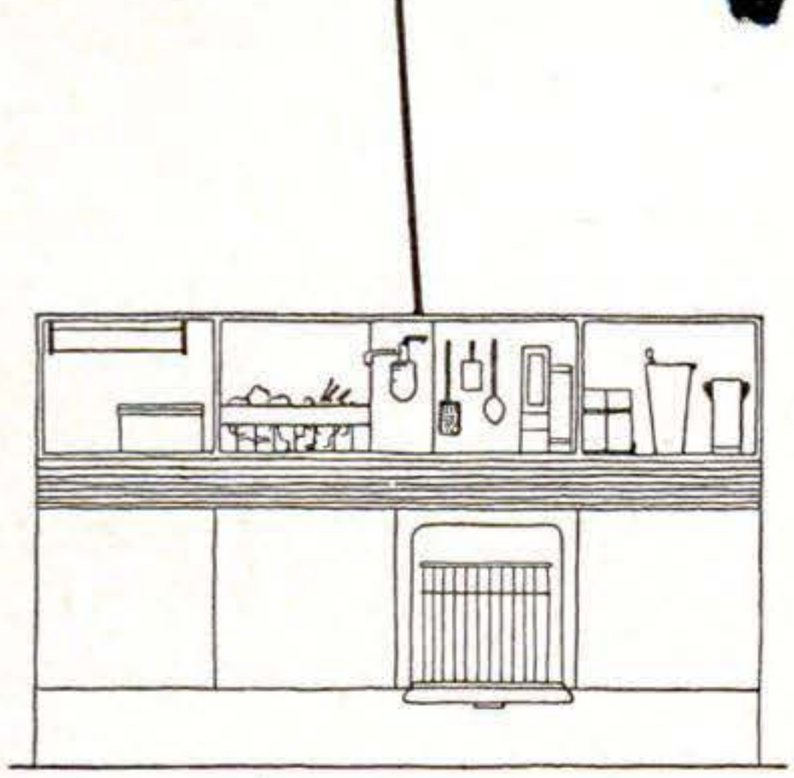
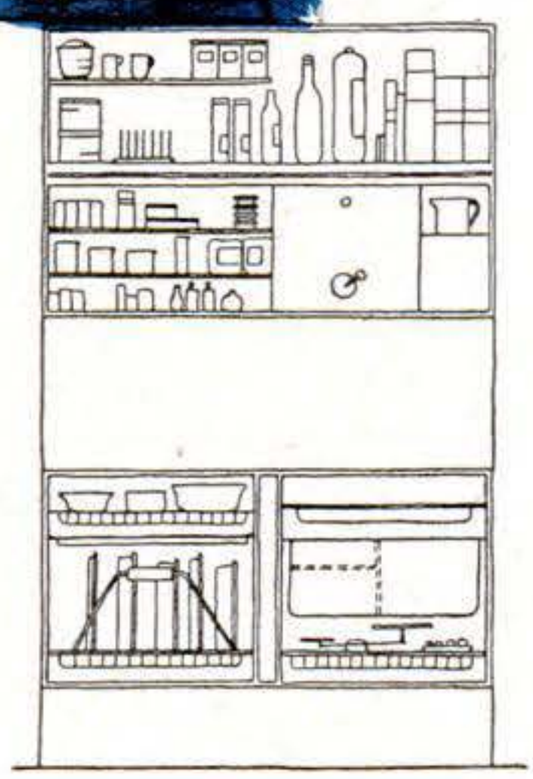
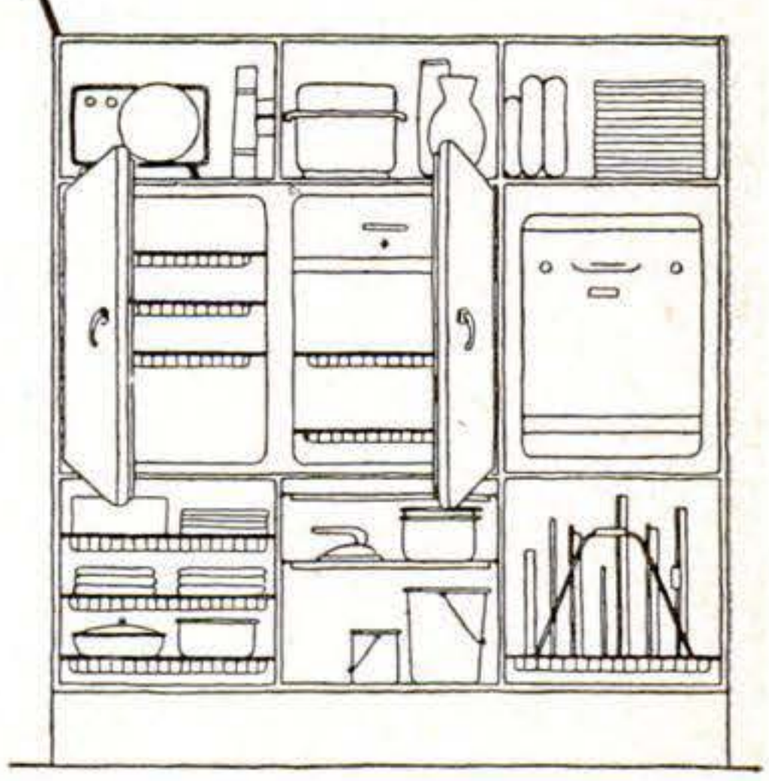


SINK CENTER has storage bins behind sink for fruits, vegetables, soaps, detergents. There's a footrest and chair so the housewife can sit at the sink. Dishwasher may be added.



MIX CENTER contains built-in bins for flour and sugar and a flour sifter. There's an electric outlet for the mixer. Cake pans are racked in cabinet below the counter.



OVEN AND REFRIGERATOR are both waist-high at center for greater accessibility. Refrigerator contains freeze chest and pull-out drawers that eliminate reaching in.

• Separate work center tailored to fit your family now, and ready to be taken down any time by a handy man for rearrangement to meet new family needs.

All these things, and many other fresh ideas, were included in the kitchen because so many experts worked on it. The experts came from the campus, from manufacturers, from federal, state and private agencies. Their work was coordinated by Glenn H. Beyer, professor of Housing and Design, and director of

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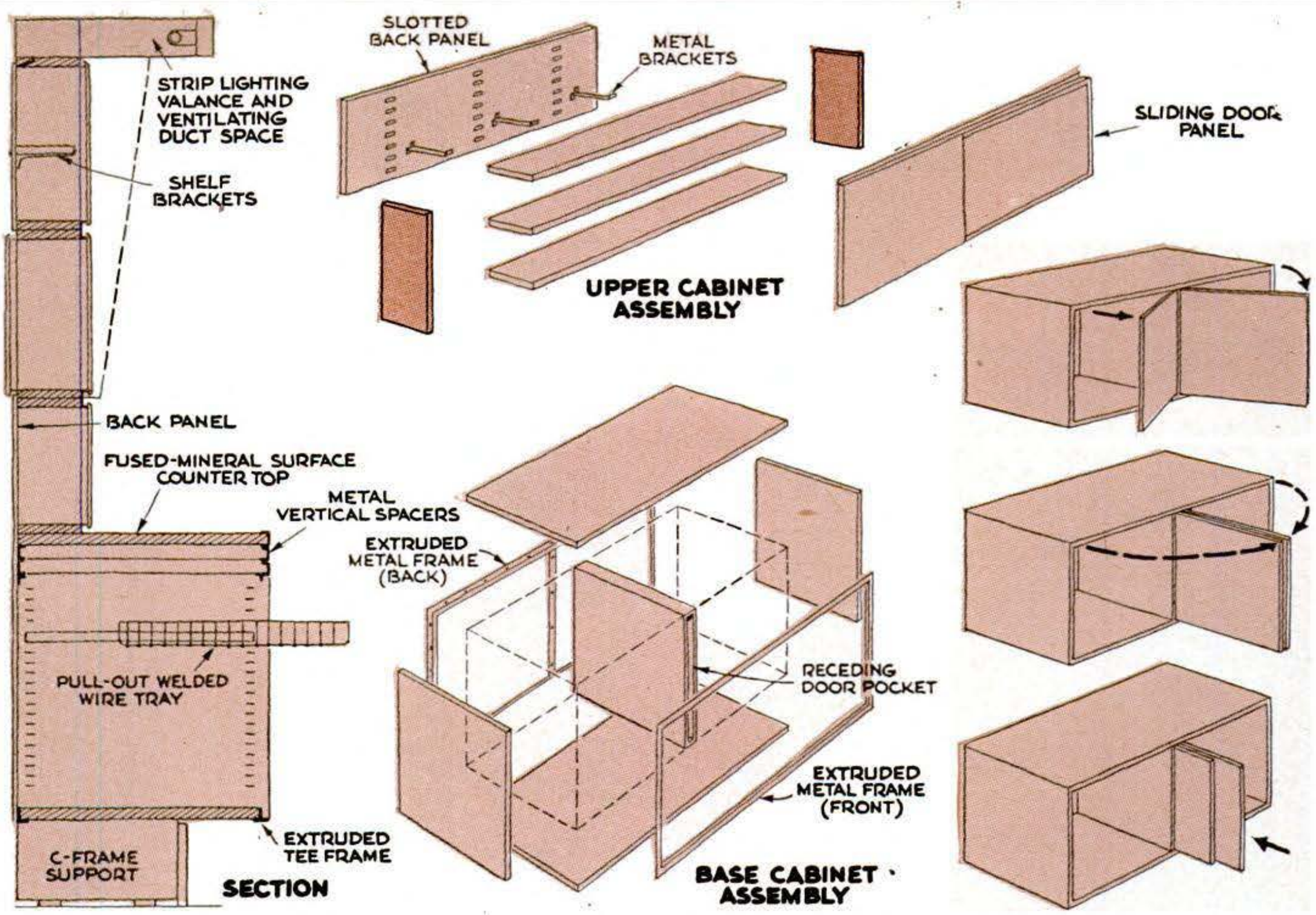

MECHANICAL DETAILS of work center: Lighting is shown at top left, pull-out tray at bottom. Top center: Shelves, brackets, parts of upper cabinet. Bottom center: Exploded base cabinet. Base cabinet doors open, slide out of way as shown in three sketches at right above. Arrangement eliminates tripping over doors, keeps contents of cabinets in sight.

Housing Research Center at Cornell.

"Build the cabinets to fit the woman," was the first Cornell principle.

How do you tell? There are no tables listing the right counter heights for women of different heights. There can't be. If there were, the varying arm lengths of women would throw off the tables.

Counter Tops to Be Raised or Lowered

Cornell solved the problem with adjustable counter tops. Any woman can learn, from a few days' experience, where her most comfortable working surface is, then have her husband put the counter top there—or do it herself. The counter top is held up by vertical spacers inserted into parallel rows of holes in the inner frame of the cabinet. They're like the supports at both ends of adjustable bookshelves.

To learn more about the woman, and so to fit her better, Cornell's home-economics department borrowed a method right out of the football team's bag of tricks.

Like most colleges, Cornell takes movies of its games and studies slow-motion pictures of them. The home-economics department photographed, in very slow motion, many women at work in many kitchens. The Cornell kitchen was planned according to results of these films.

Almost no women, they showed, ever used the oven and range top for the same kitchen job. So Cornell separated oven from range. It put the oven next to the refrigerator, and built both oven and refrigerator into one work center at a waist-high level.

The Cornell kitchen thus is not a collection of separate stove, icebox, sink, and cabinets, like an ordinary kitchen. Instead, it consists of five work centers—the oven-and-refrigerator, mix, sink, range, and serve centers.

The centers are planned around the ideas of Mrs. Mary Koll Heiner, among others. Mrs. Heiner is associate professor in Cornell's home-management department, and a woman who for 35 years has worked to simplify the labor of the homemaker.

Mrs. Heiner and her associates, some

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ALL DRAWERS, TRAYS in base cabinets pull out. There is no reaching to permanent back shelves. Range burners are in a staggered line so food being cooked is easy to watch.

REFUSE CONTAINERS are at sink. There are three: for paper, waste food, cans. Door holding them clicks back into waste corner space under counter above.

years back, came up with a new principle to help the cabinets fit the woman. It is called the principle of storage at the point of first use. It means everything in the kitchen is kept where the homemaker will use it first.

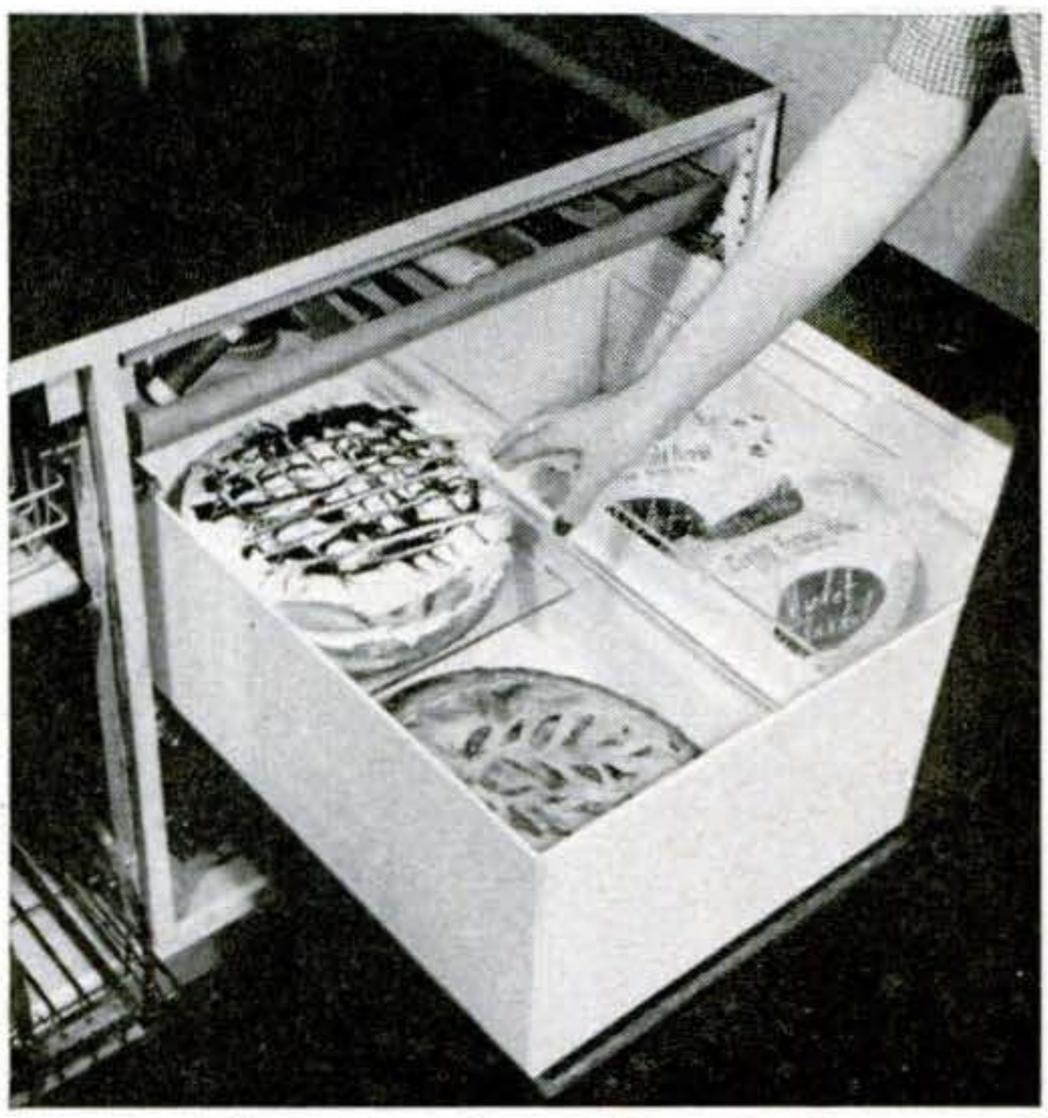
This principle of storage at point of first use saves literally miles of walking.

Researchers Were Sent Out

"Build the shelves to fit the supplies," was the second Cornell precept.

Professor Beyer—with the assistance of housing-research staff members from the State University of New York and the U. S. Department of Agriculture—sent droves of researchers into homes from Maine to West Virginia to find out what was kept in kitchens. They found that, regardless of family size, most housewives keep about the same amount of food and supplies on hand, and have about the same equipment. Only exception to the rule are perishables like bread.

So the Cornell kitchen has a place for everything U. S. families keep in kitchens. Most supplies are stored between 30 and 60 inches off the floor, making reaching for them easier.



PULL-OUT bread- and cakebox is feature of mix center. Transparent plastic covers keep bread, cake, pie from drying out. Kitchen has pull-out breadboards and lap boards.

"Build the kitchen to fit the family," was Cornell's third and last rule.

Architect Frank Weise of Philadelphia

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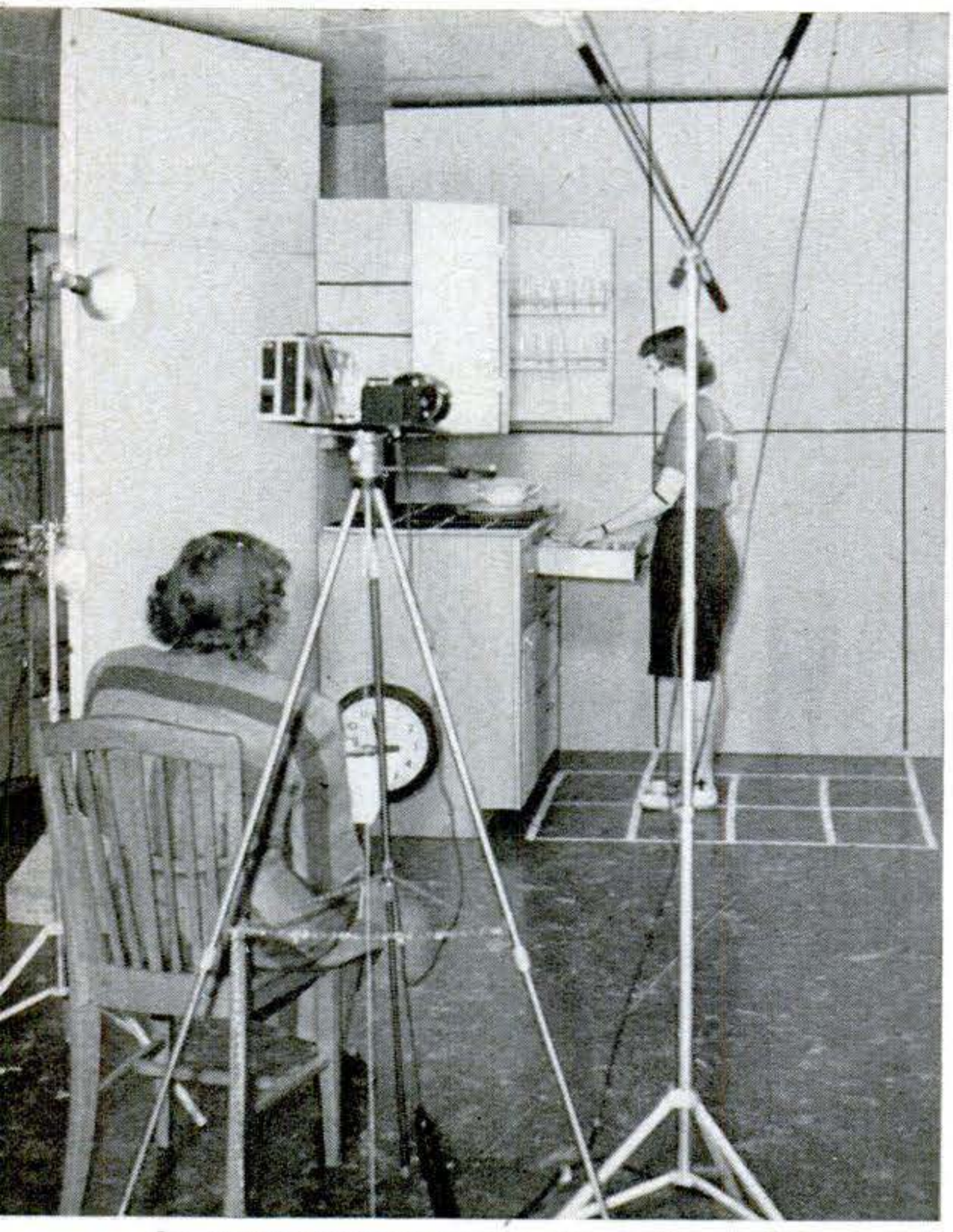
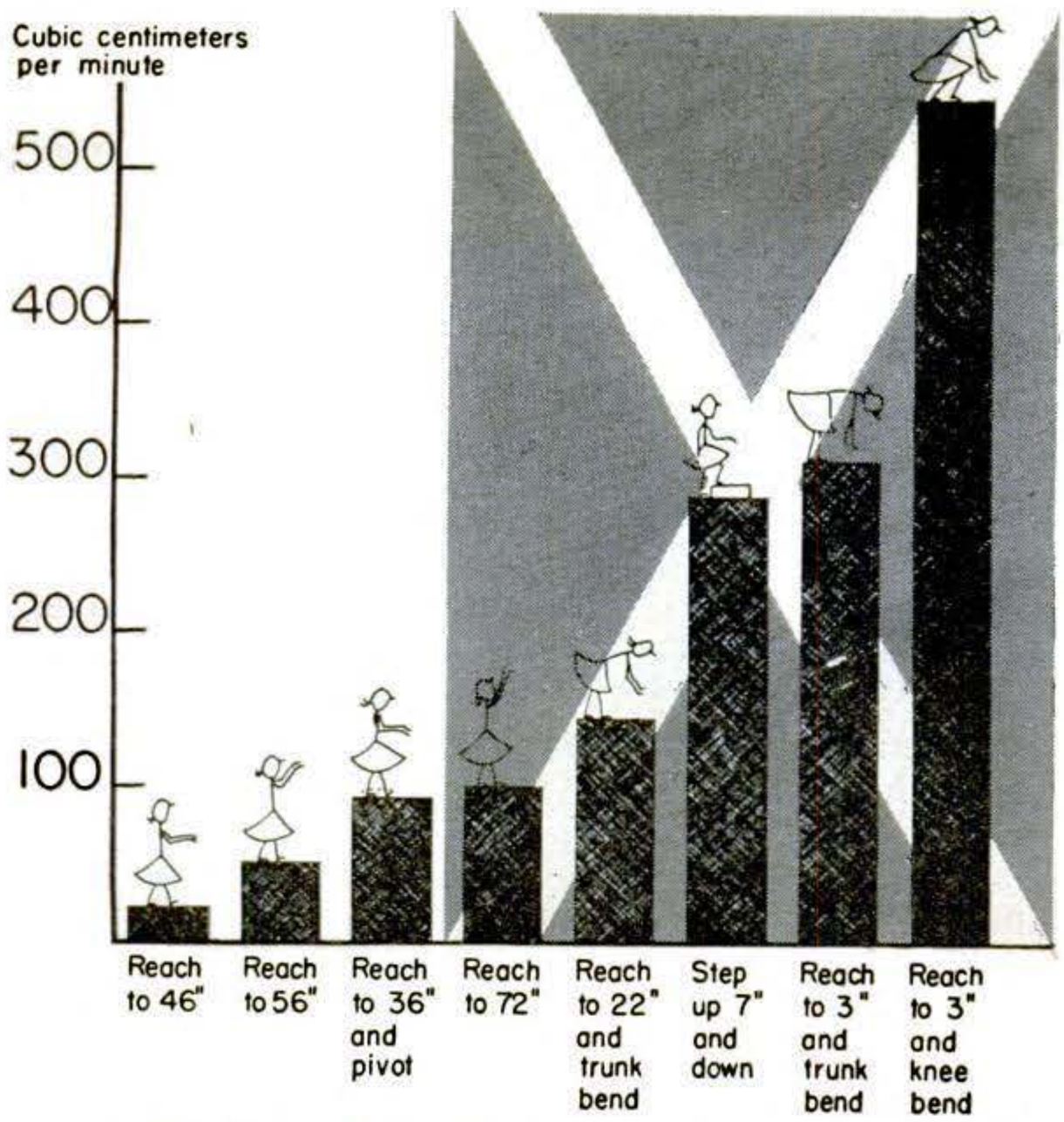


IN PLANNING KITCHEN, Cornell used "memo-motion" (very slow) movies to show housewife's actions. Wall and floor lines showed her position. Clock timed everything.



THE MORE OXYGEN a woman consumes while working, the harder she is exerting herself. Cornell kitchen eliminates most movements shown in chart, except three easy ones at left.

took the ideas produced by Professor Beyer and Mrs. Heiner, and all the other experts, and put them into work centers designed as you see them in the photographs and drawings.

Range, mix, and serve centers are each four feet long; the refrigerator-oven center, six feet; the sink center, eight feet. Grouped as a U, they can all go into eight by 12 feet. That's all the space you need for a complete Cornell kitchen.

Or the work centers can form an L, or go along a long wall. This leaves more room for your child to play, for a breakfast nook or an easy chair.

The work centers are free standing—do not have to fasten to the wall. They can run right across the middle of the floor, and divide a big room into a kitchen and room for a laundry or other purpose.

Easy to Put Up

For the handy man's convenience, the Cornell kitchen will be made largely of standardized doors, counters, trays, and other parts, and it is planned for simple erection. This consists mainly of bolting cabinets to the back C frames supporting them, and attaching cabinets to floors with bolts that adjust for differences in floor level. "It is," says Beyer, "a one-man job—no more trouble than making something with an Erector set."

Almost any color, including natural wood, will be available when the kitchen is manufactured. Cornell hopes it will be on the market sometime in 1954. For more information now, write the Mailing Room, Roberts Hall, Cornell University, Ithaca, N. Y., send $1, and ask for the booklet, *The Cornell Kitchen.*

The kitchen, once in manufacture, will be a contradiction in terms:

- It will be mass-produced and therefore moderate in price.
- Though mass-produced, it will also be custom-built—because it can be arranged to suit any family's needs.

You will even be able to take down the Cornell kitchen and carry it along when you move. That is, if the people who buy your house will let you.

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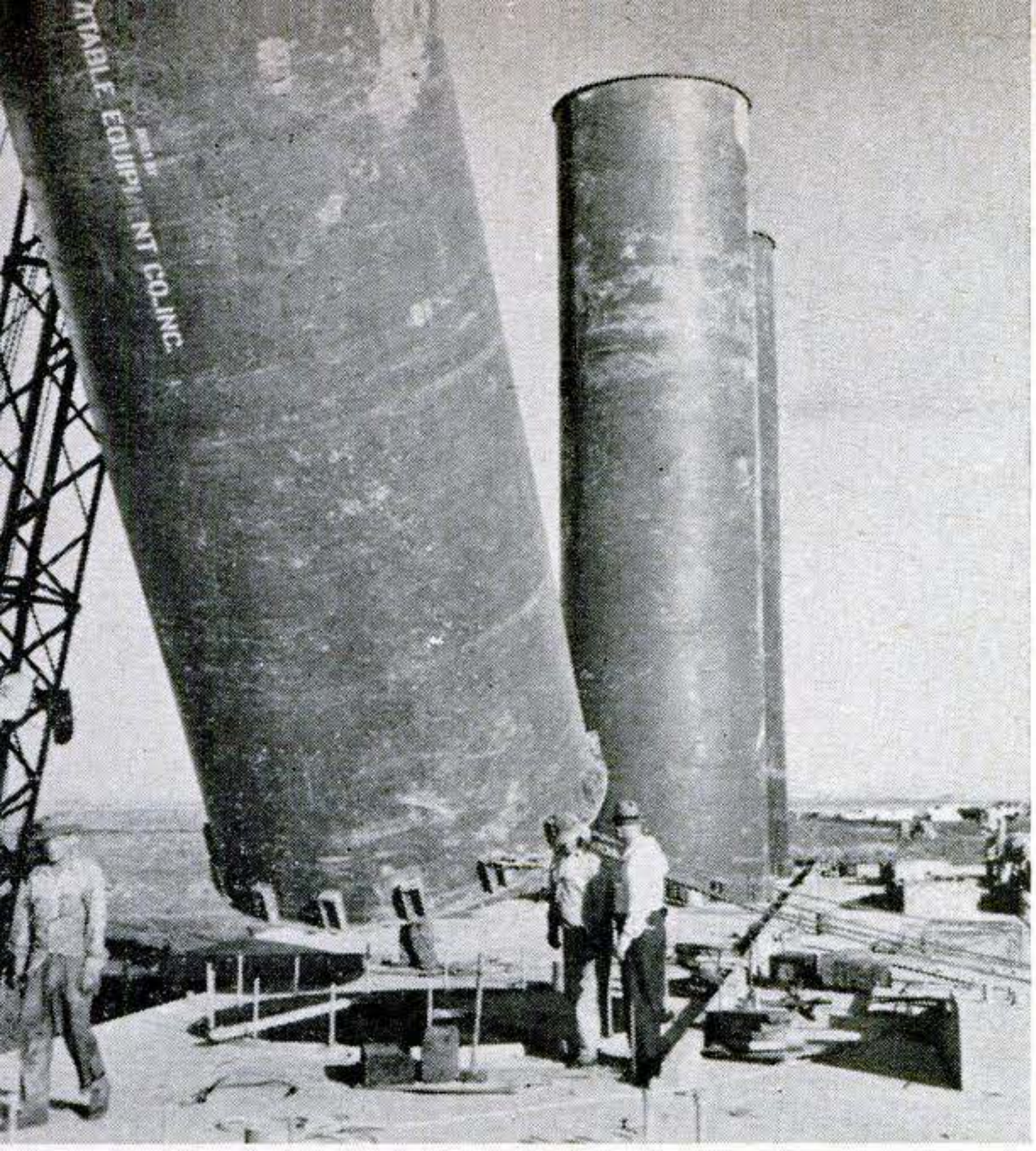


Mining Brimstone with Water

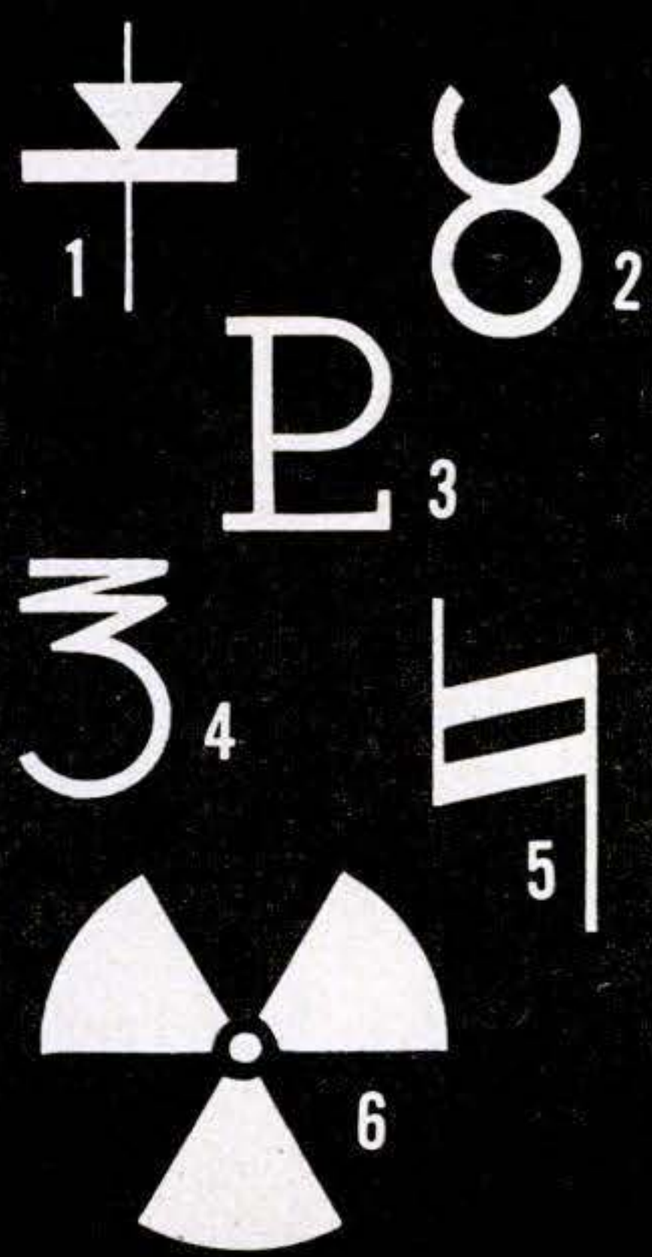
HOT water from these flue-gas heaters will melt sulfur and bring it to the surface, in a multimillion-dollar plant at Garden Island Bay, La., where one of the world's greatest deposits has been found.

Tool Digs a Square Hole

SQUARE holes are dug for square posts by the implement above, exhibited at an inventors' show in London, England. It takes a 6½-inch-square bite, and can be used to excavate larger areas, too.

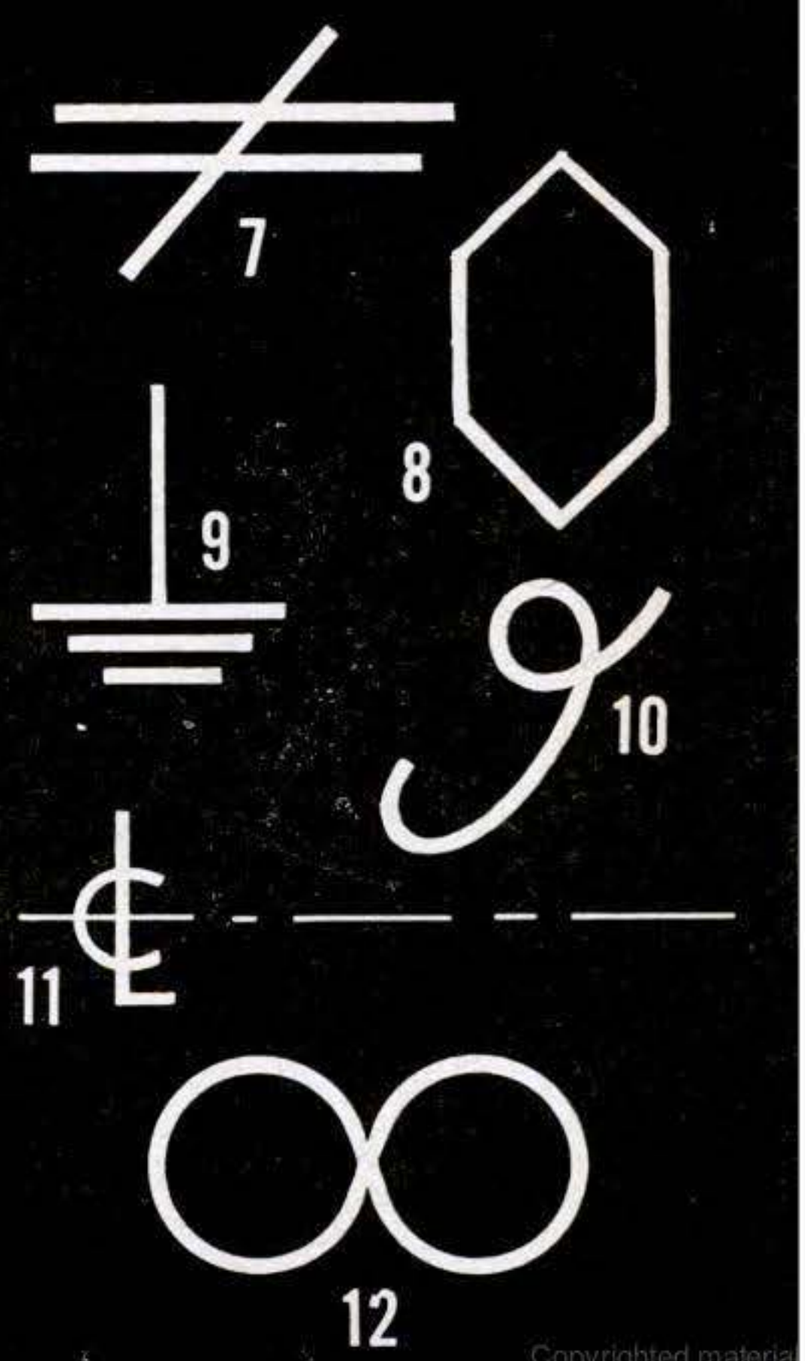
Can You Read Signs?

Here are 12 symbols used in sciences, arts and crafts. See how many you can identify correctly, by writing each one's number after the right definition in the list of 13 below. Fair warning: The extra definition is false – leave a blank space after it. To check your score, see upside-down answers at bottom of page.



A. The planet Pluto. .....
B. Natural in music. .....
C. Electrical ground. .....
D. Is unequal to. .....
E. The constellation Taurus. .....
F. Delete. .....
G. Center line. .....
H. Rectifier. .....
I. The benzene ring. .....
J. Long-play record. .....
K. Infinity. .....
L. Radioactive hazard. .....
M. Apothecary's ounce. .....

Answers: A-3; B-5; C-9; D-7; E-2; F-10; G-11; H-1; I-8; J-false; K-12; L-6; M-4.



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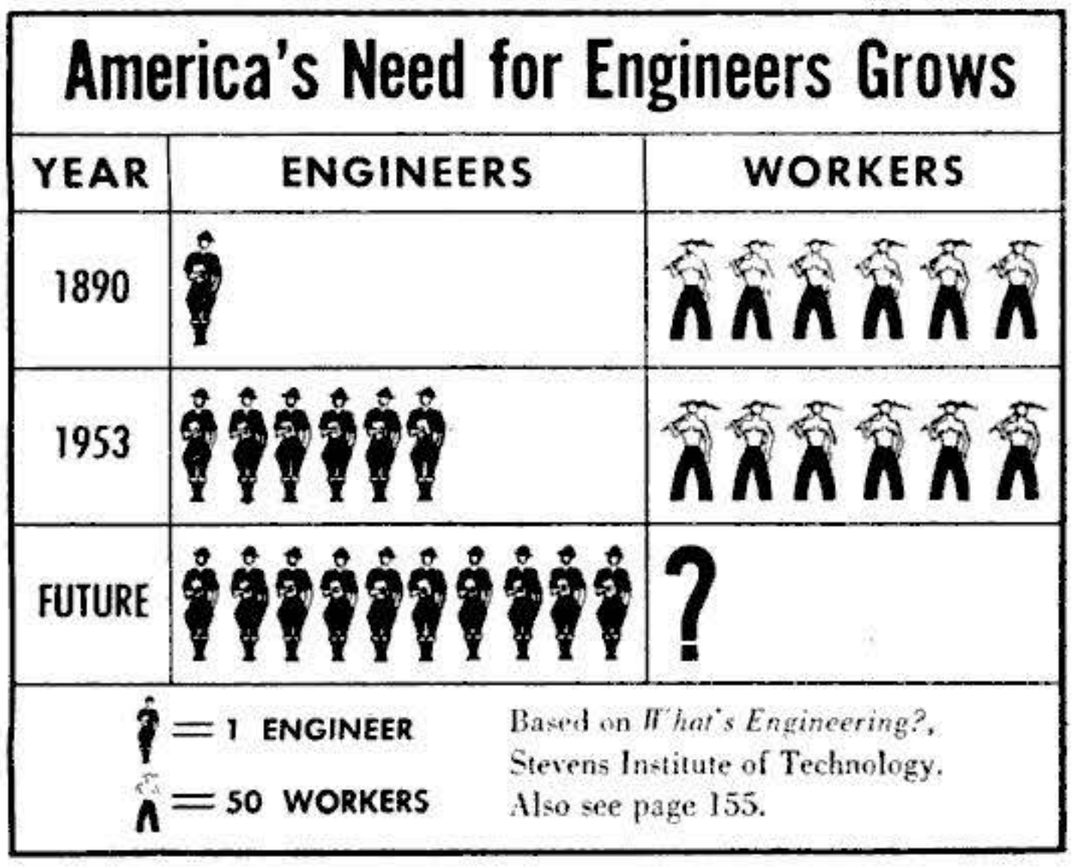
P.S.

Last minute news & notes...

IN DETROIT some folks are worried by leveling off and possible slight downcurve in average annual mileage put on cars. One explanation is more families now have two cars; another, that roads are so jammed people stay home more . . . Auto makers, blandly stating, "What horsepower race?" are still boosting engine power. One engine may be hopped up by an eye-popping 25 percent in '54 . . . Annoying bugs are reported to have held up release to public of Studebaker-Warner Gear mechanical power steering described in PSM last winter . . . Unexpected headache in some 12-volt auto ignition systems has turned up: cross-firing. It's caused by induced voltages between high-tension wires lying close together, and is being corrected on production cars by positioning wires more carefully.

NYLON-CORD PASSENGER TIRES have been brought out by U.S. Rubber and Firestone. Latter is tubeless. Nylon is said to increase strength up to 90 percent . . . Driver's licenses are now required in every state in the Union. South Dakota is latest to pass law . . . Meanwhile 10 more states require turn-signal devices on new cars, making 14 so far.



ODOR-FREE OIL PAINTS, including glossy finishes, are announced by Du Pont. They use new mineral spirits that don't smell . . . Du Pont's new photographic film base is said to be twice as strong and four times as stretchable as present types . . . A Vermont company sprays cactus fibers with U.S. Rubber's latex, stuffs them into cushions, while Florida scientists have found a way to get wax from Spanish moss. They say it gives a hard, glossy finish to woodwork.

ADMIRAL BYRD is planning a new South Pole expedition . . . Rubber-tire particles make up 40 percent of airborne city dirt, according to a Chrysler Airtemp survey. Other elements: coal soot, 30 percent; sand and grit, 20 percent; live bacteria, 10 percent . . . Trolley coaches are 3.5 cents per mile cheaper to run than motor coaches, reports Ohio Brass Co. Chief saving: they can be left outdoors, yet last longer.

GOLFERS SHOULD STUDY PHYSICS to improve their games, says an Iowa U. professor--who shoots in the low 70s himself. Ballistics, rotational energy and friction play a big part in the game. One tip: hit low on the ball when putting, so that it slides first, then rolls.

JUNIOR'S MUMPS got you worried? Doctors say 30 to 50 percent of grownups have had disease without knowing it. A skin test reveals immunity . . . Fat children actually eat less than skinny ones, a study of patients at a Boston dental clinic indicates. Possible explanations: their stout build, hereditary, conserves body heat better than thin physiques; they may be less active than lean children.

OUR ATOM BOMBS are kept in underground arsenals, the AEC reveals, in asking funds to build more--the existing ones are becoming crammed to capacity. Never mind asking where they are, that's "top secret" . . . A household water-softening chemical has been found the best thing to clean up with after an atomic blast. It removes radioactive debris from walls, furniture, skin.

The Editors

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Lifting, they say, is done by men with weak minds and strong backs. Be smart! Learn how . . .

Riggers' Secrets Lighten the Heavy Jobs

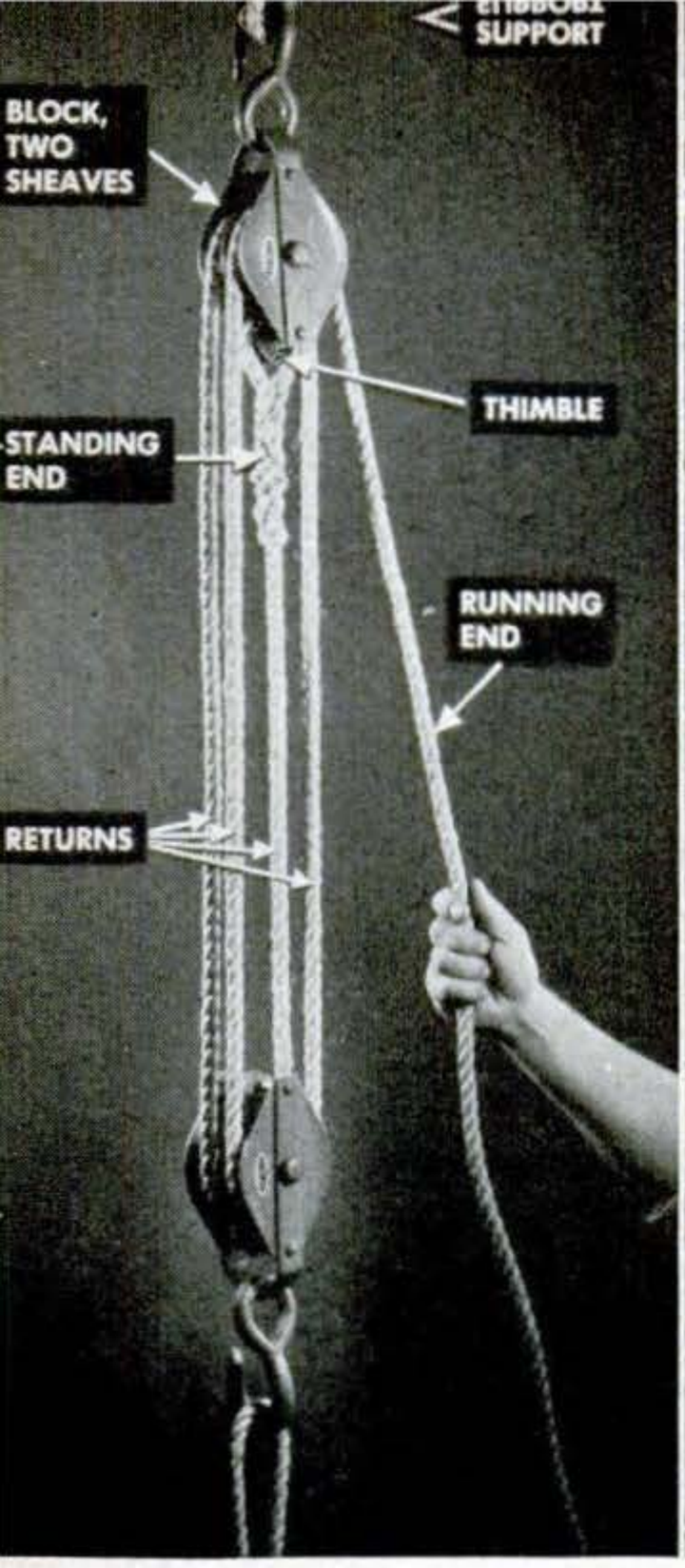
By Herbert R. Pfister

LIFTING is for circus performers, not the home handy man. Sliding will almost always do the same job easier. If your wife wants the refrigerator shifted, use a short two-by-four to tilt it while you slip a small rug underneath. Then just push. The same technique works fine for radiators and heavy furniture.

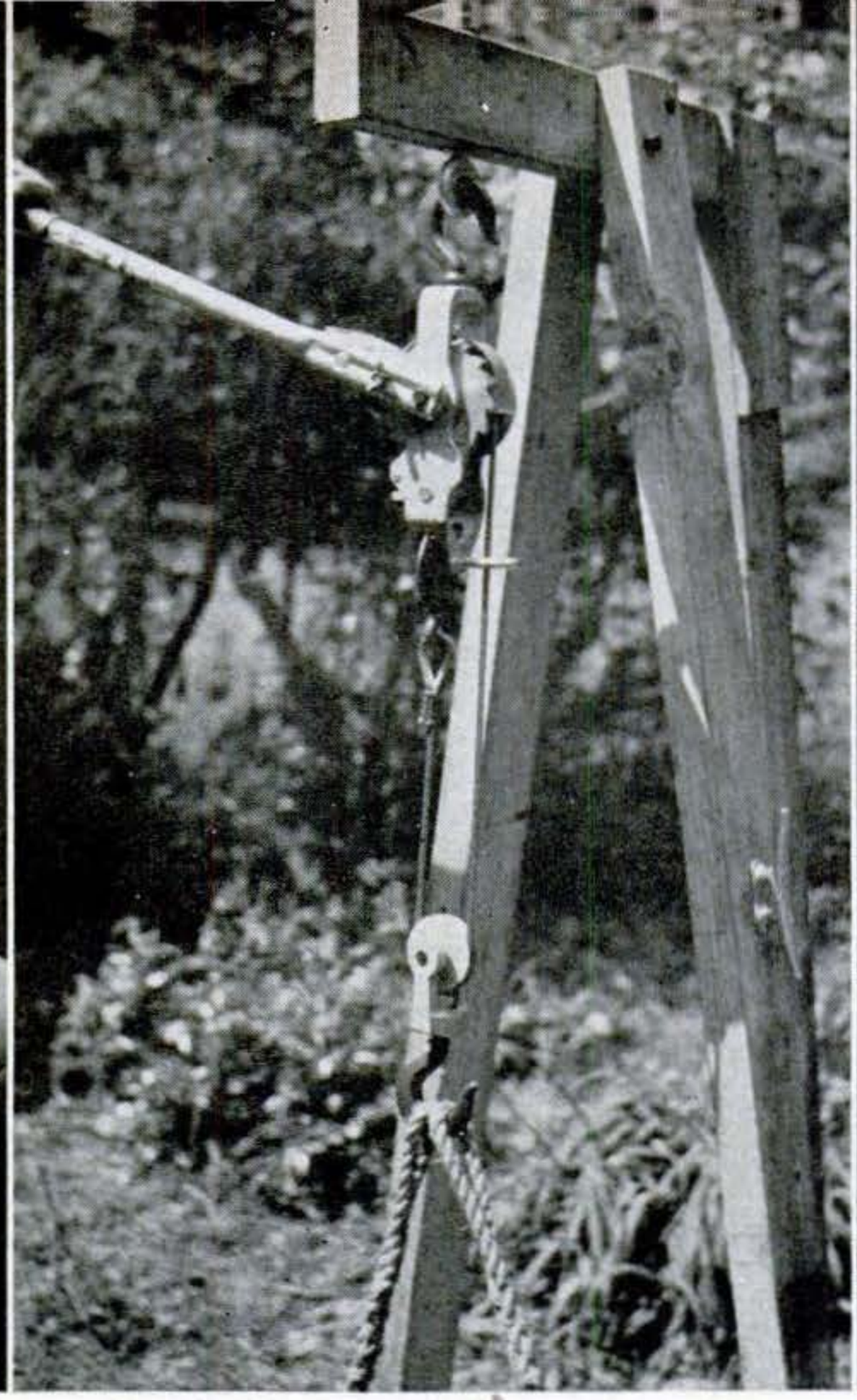
You can even slide things outdoors, over carpeting or up and down stairs. Just put down boards to form tracks.

Simple rigging equipment is the answer for more complicated or more frequent jobs. A pair of small blocks costs only a few dollars and multiplies your muscle power about five times. Add a homemade dolly and a frame and you're ready to make quick and easy work of heavy chores. The pictures on the following pages show you how.

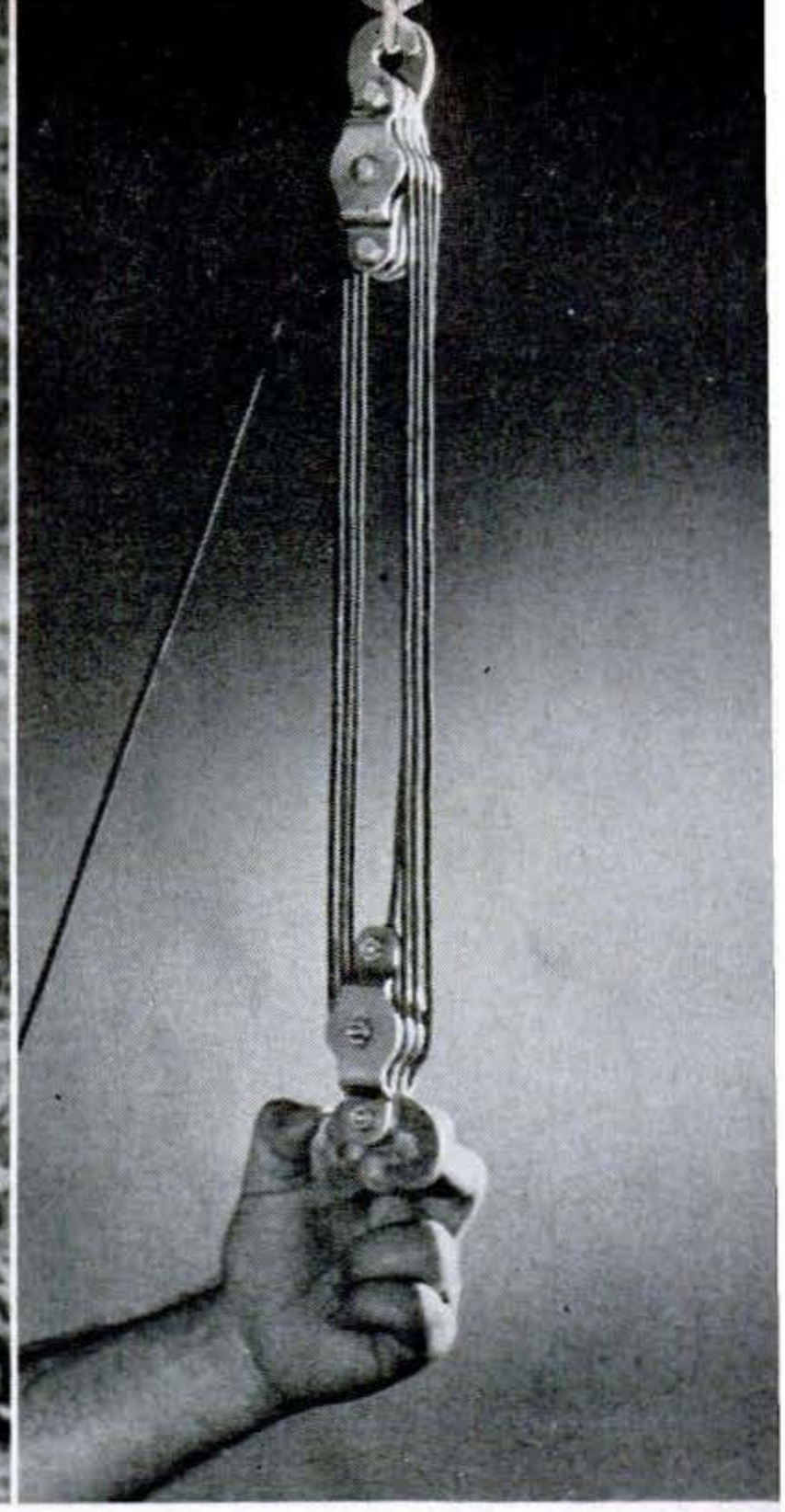
TWO BUCKS SAVED. Peat moss, like lots of other things, is cheaper if you cart it yourself. Home-built A frame, blocks and rope make it easy to haul heavy, bulky objects in car.



STANDARD BLOCKS with two sheaves apiece cost less than $5 for a pair, provide 5-to-1 mechanical advantage. Labels identify parts.

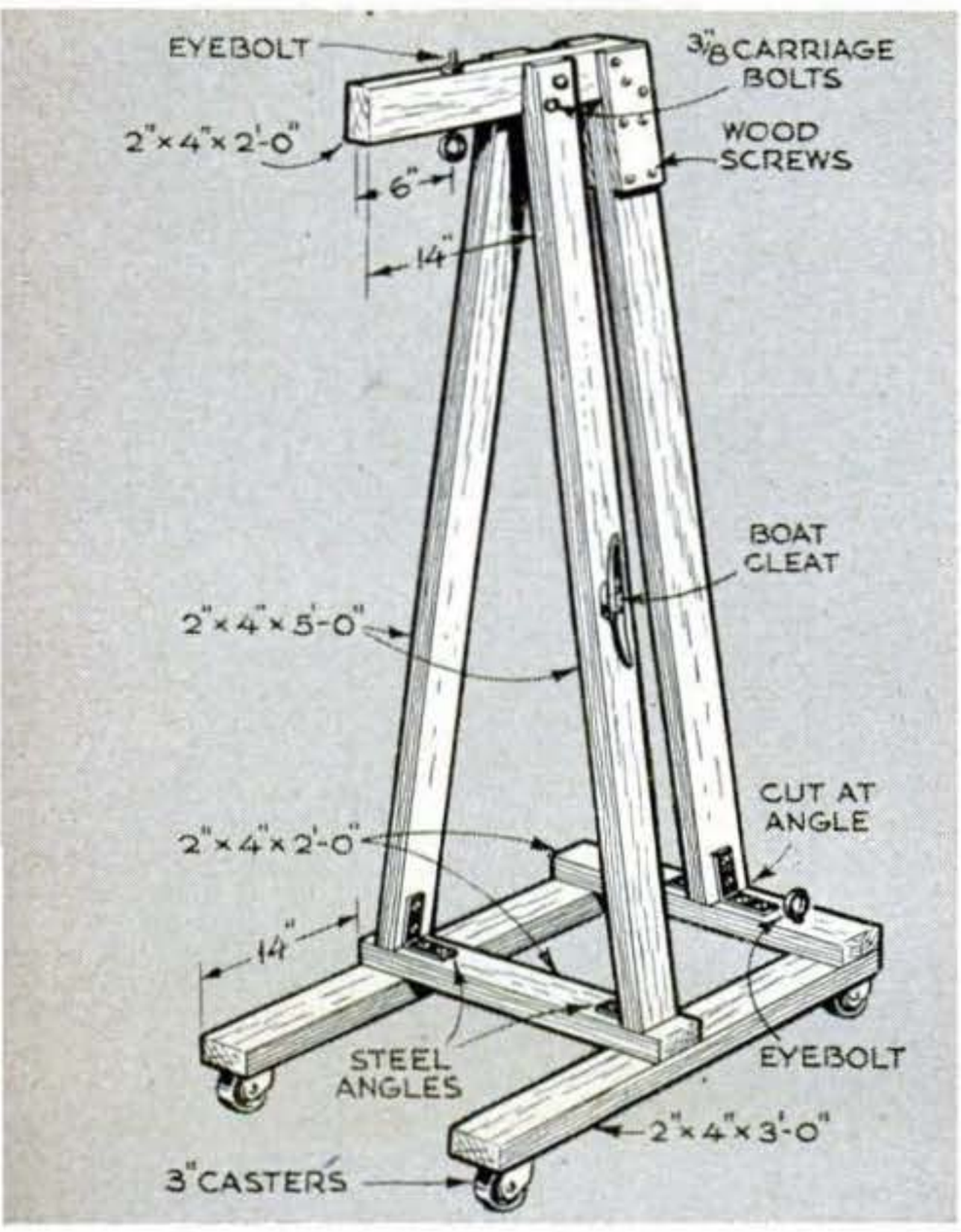


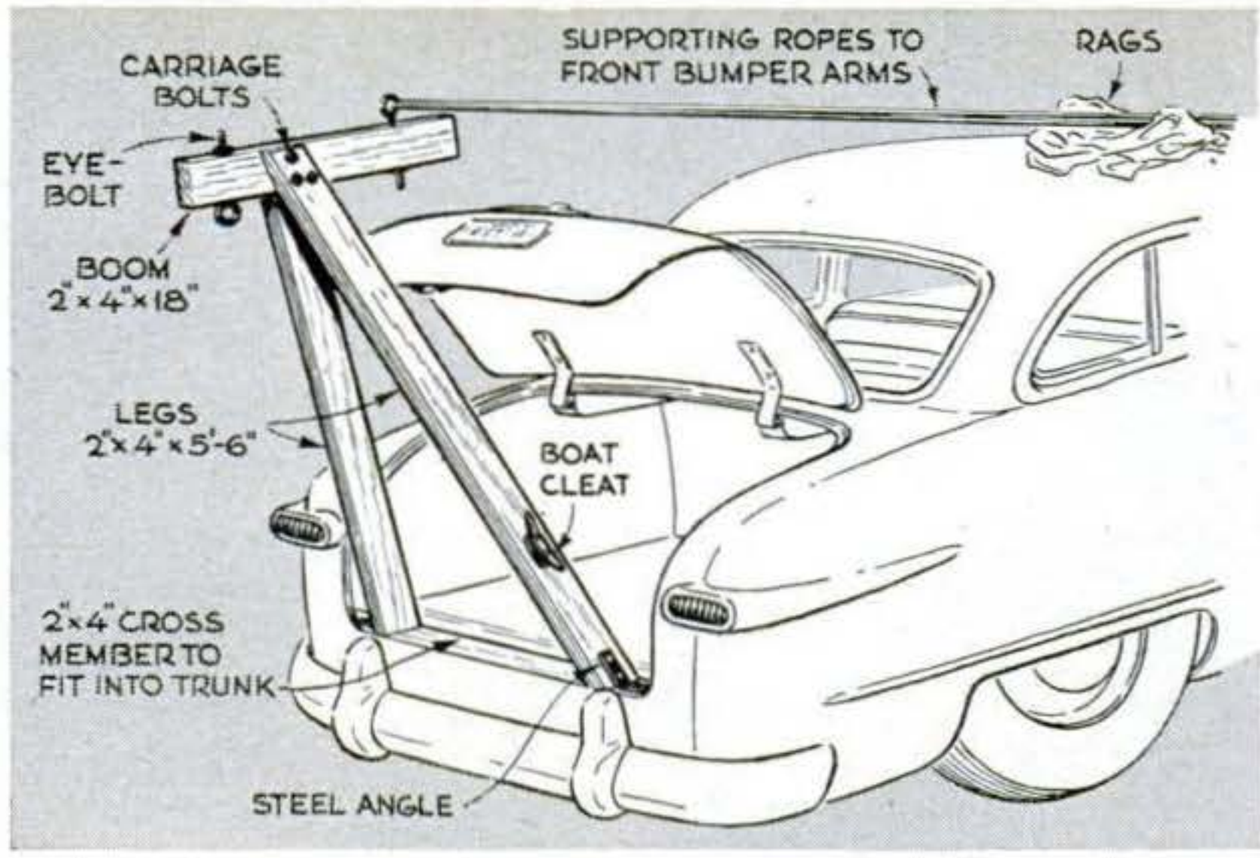
RATCHET-ACTION HOIST simplifies rigging, since the pawl locks a load in mid-air. Loads of more than a ton can be handled safely with this one made by Lug-All Co., Wynnewood, Pa. Handle bends if overloaded.



MIGHTY MIDGET can lift 1,000 lb. with nylon rope, has triple sheaves for 7-to-1 gain. Western Control Corp., Wichita, Kan., makes the Handy Hoist.

These Are the Lifting Devices to Use





A FRAME will support your hoist wherever you want to use it. The two shown, built of two-by-fours, provide a way to move as well as lift the load. The one above, for long hauls, is designed to fit in the drain well found behind the trunk of many cars. The other, sketched at left, makes shorter moves easy. Its detachable dolly can also be used alone for many moving jobs. Four angles hold frame on dolly.

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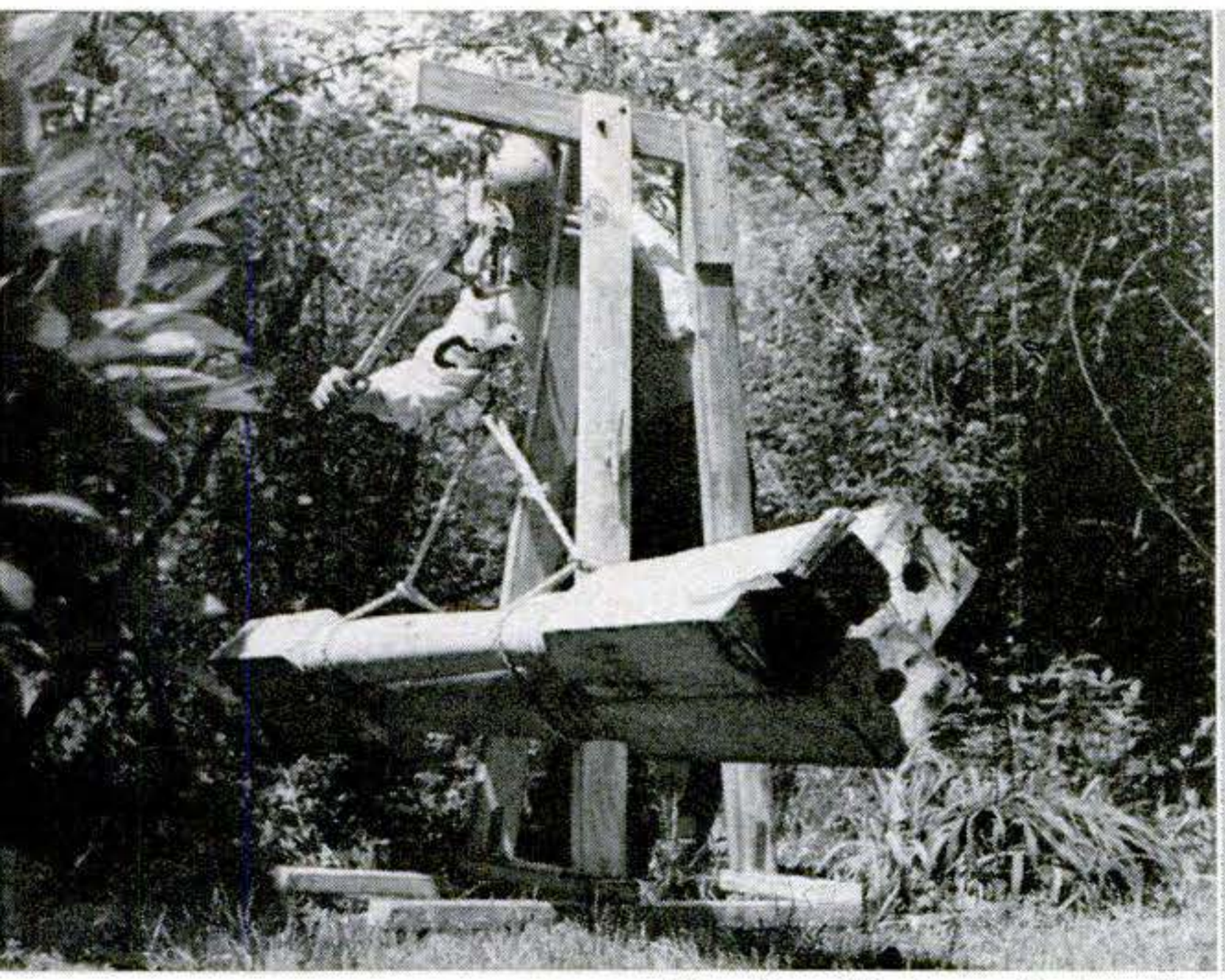
These Are Some Jobs You Can Do with Them

IF YOUR attic has a trap-door access, block and tackle are practically essential. You then can hoist into the attic heavy trunks and unwanted machines and furniture that otherwise would take up valuable closet space. But rigging gear comes in handy around any kind of home, inside and outside, for a wide variety of jobs. Some ways to use it are suggested here.

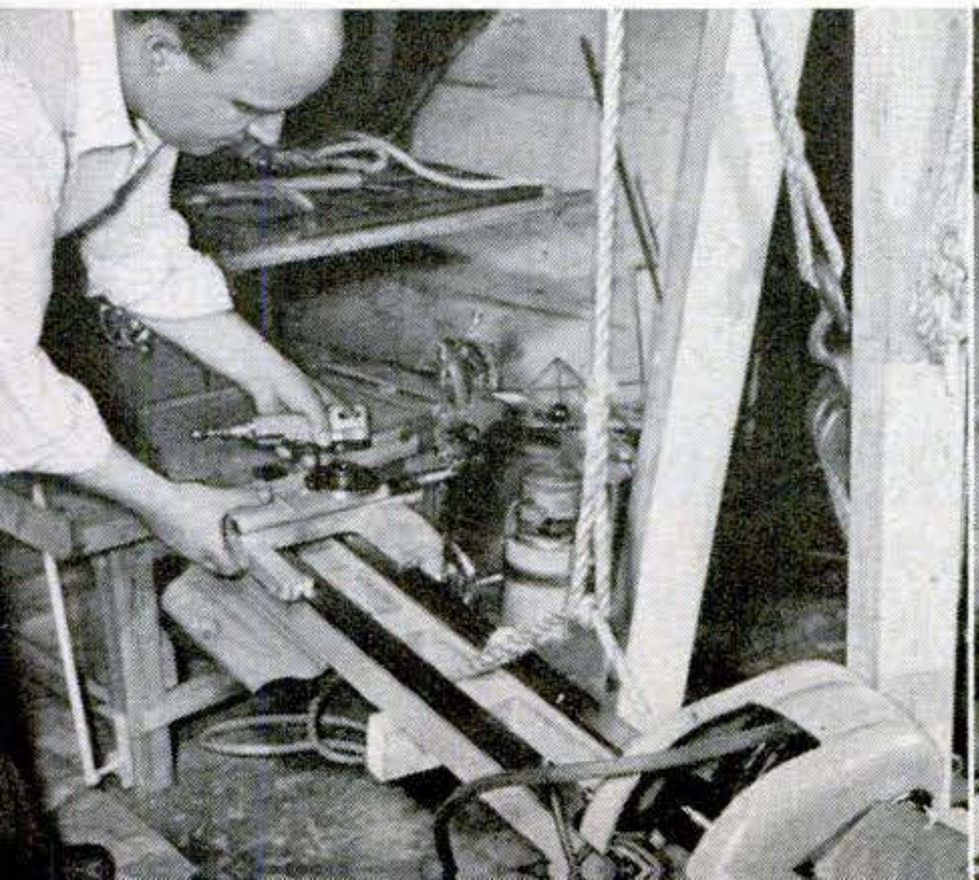
LIFTING'S NOT THE ONLY JOB for block and tackle. Here car is pulled from muddy ditch with tackle attached to convenient tree on opposite side of road. Bumper arms take strain.

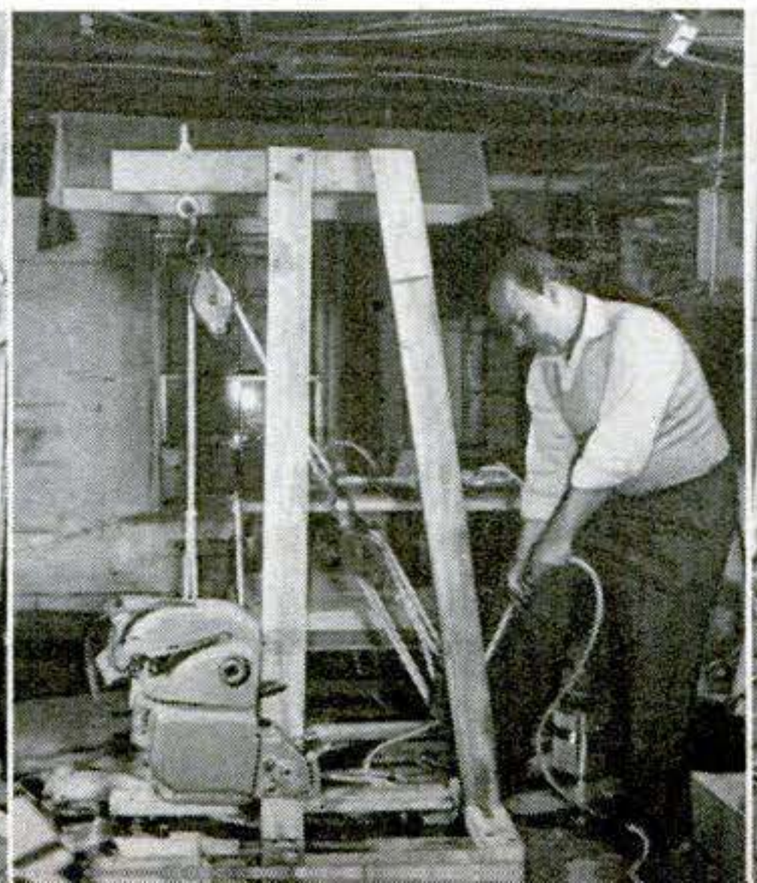


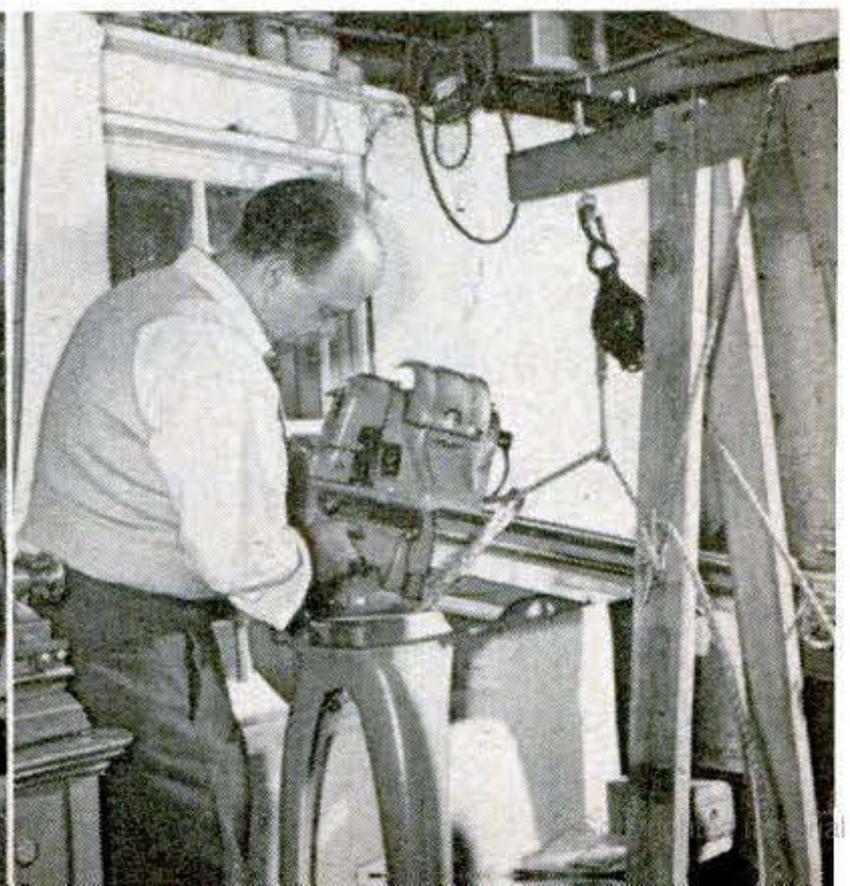
HEAVY COLUMNS are lifted, rolled out behind garage. Large casters or rubber-tired wheels are necessary to roll dolly crane on soft earth.

HEAVY TRUNK is backbreaking job to drag into attic. Wrapped with long sling, it can be hoisted through trap door with little effort.

SETTING UP A NEW LATHE is a job for which you usually would need several husky neighbors. But the dolly crane lets you do the job alone. Rope sling is wrapped around heavy headstock (left below) with wood block to protect lead screw. In this case, single block gives high lift required; a double one would hang too low. However, double block is hooked between dolly eyebolt and short lifting line (center) to keep mechanical advantage. After lathe is raised, head end is set on the stand first (right). Then dolly is pushed close to swing in tail. ***(Please turn page for more photos about rigging.)***



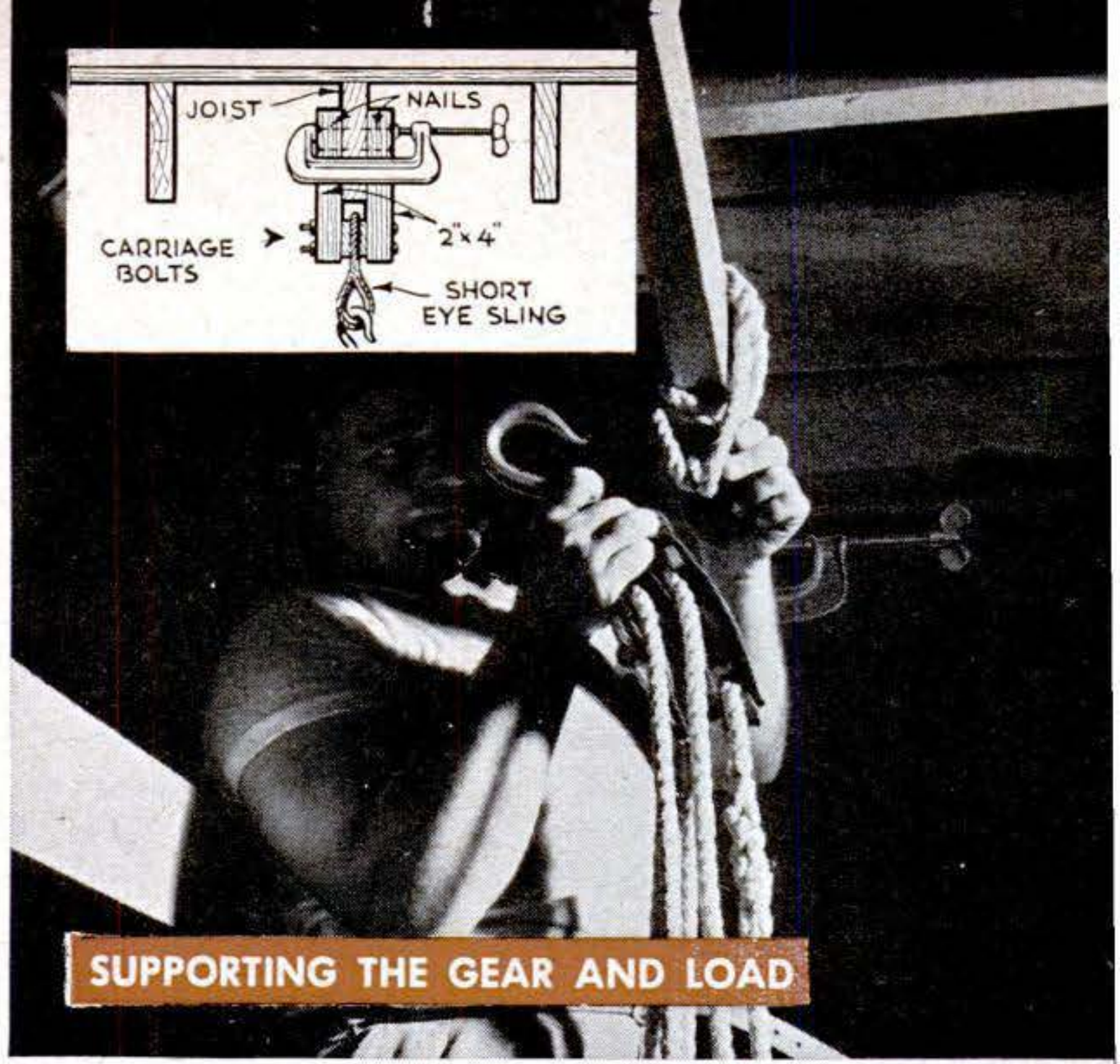




How to Rig a Load

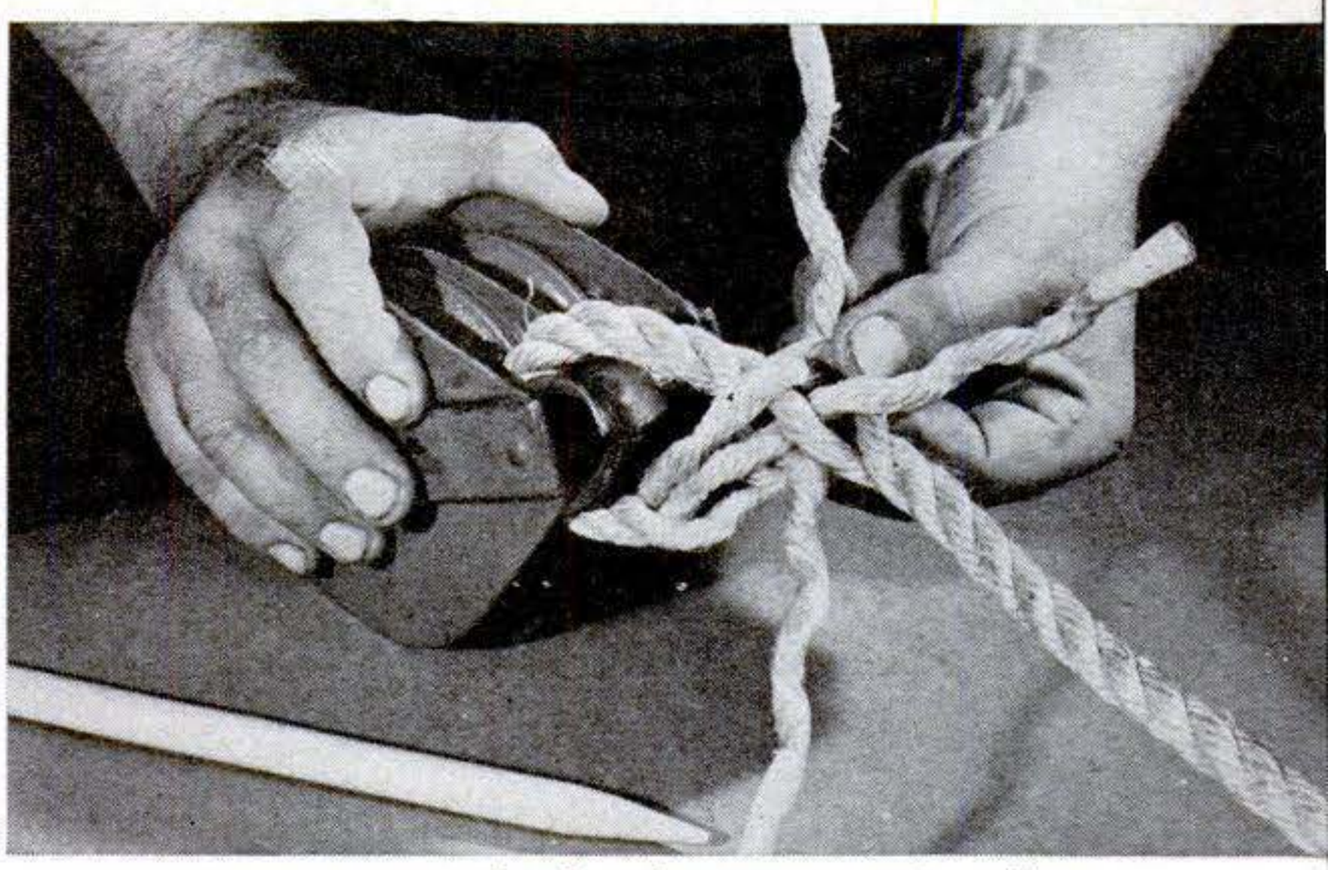
To MAKE full use of the surprising strength of light gear, you need sturdy support for it. An A frame works fine, but a hefty tree limb or a two-by-four firmly fastened to rafters will serve, too. If you just want to drag a heavy object, try these supports for your blocks: outdoors, solidly driven stakes; indoors, a two-by-four placed *outside* a window so that it straddles several studs of the house wall.

Carefully rigged ropes are just as important. Professional riggers use knots, but only when splices won't do. Even a well-tied knot may reduce lifting capacity by a third, while a good splice is almost as strong as the rope itself.

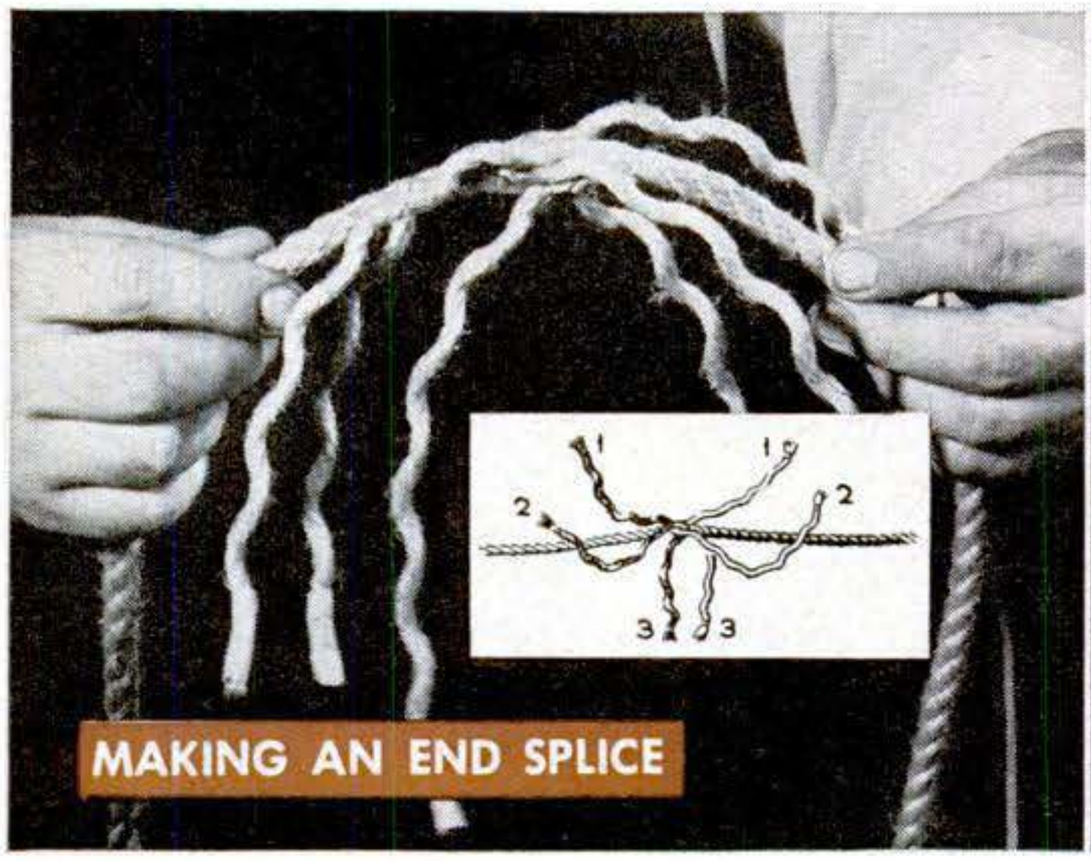


TWO-BY-FOUR nailed across attic rafters supports block from short sling. Note clamps to prevent nails from loosening. Other supporting arrangements are shown in sketch above.

VERSATILE EYE SPLICE is started by untwisting three strands for about 6" and wrapping the strand ends with tape (to prevent unraveling).



PARTIALLY UNTWIST body of rope at point that will give eye of desired size and tuck strands through. They should emerge at 180° angles.



TO JOIN TWO ROPES or make endless sling, use end splice. Untwist ends, interlace so strands of one end are separated by those of other.

TIE MATCHING STRANDS with overhand knot and pull taut. Strands should now project from rope at 120° angles.

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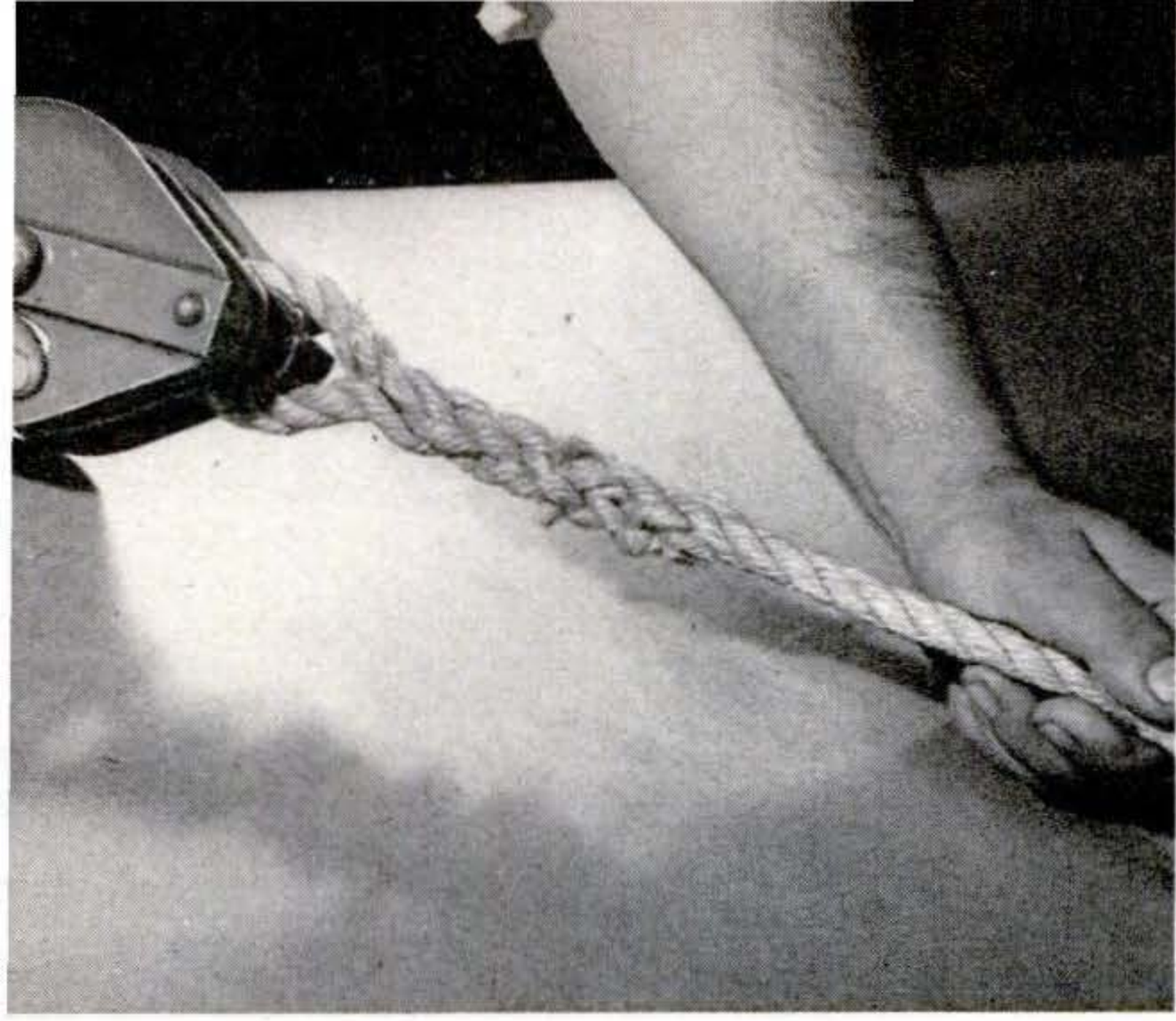
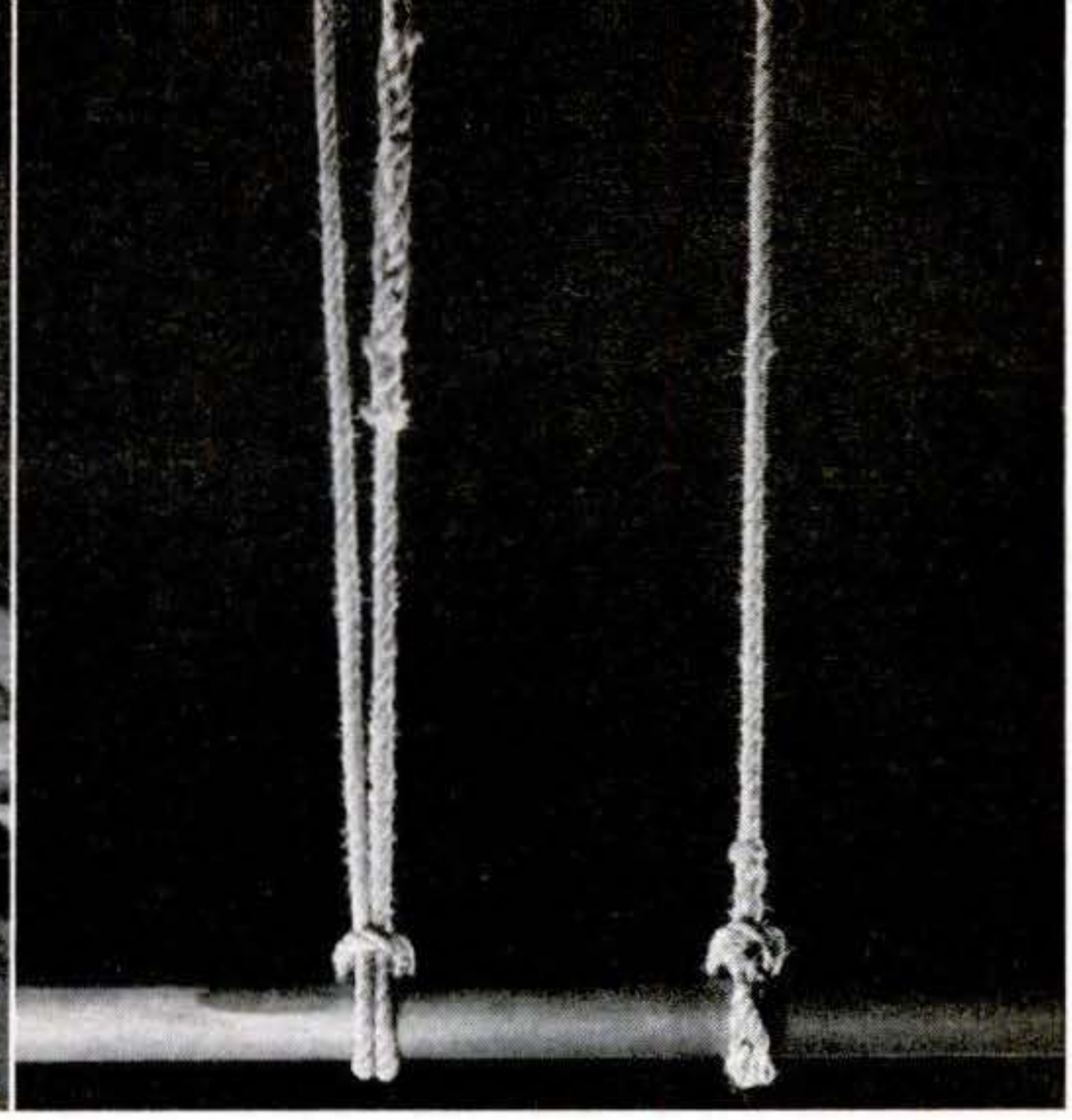
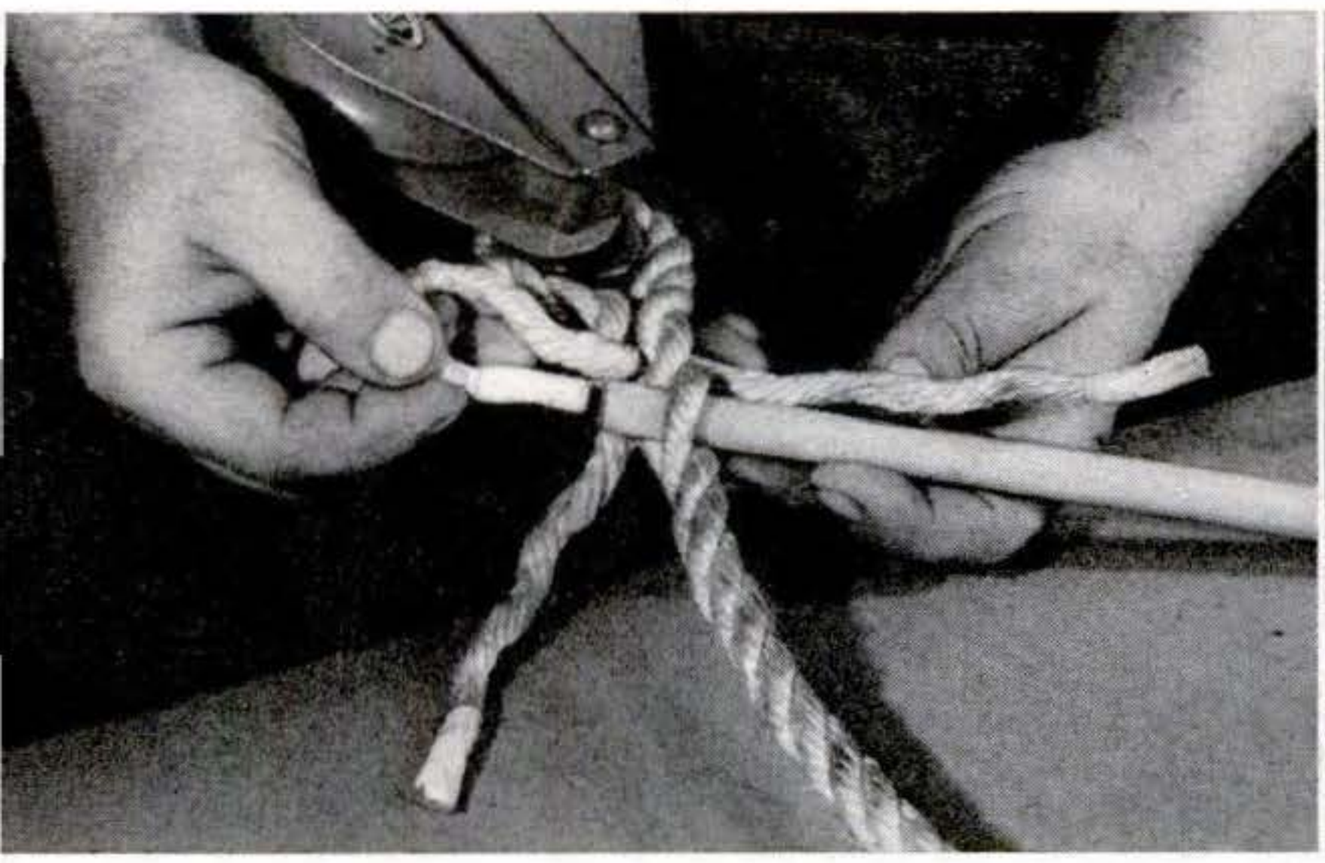


EYE SPLICE is best method of attaching standing end of rope to thimble at bottom of upper (fixed) block. Two half hitches could be used, but would not be nearly so strong.

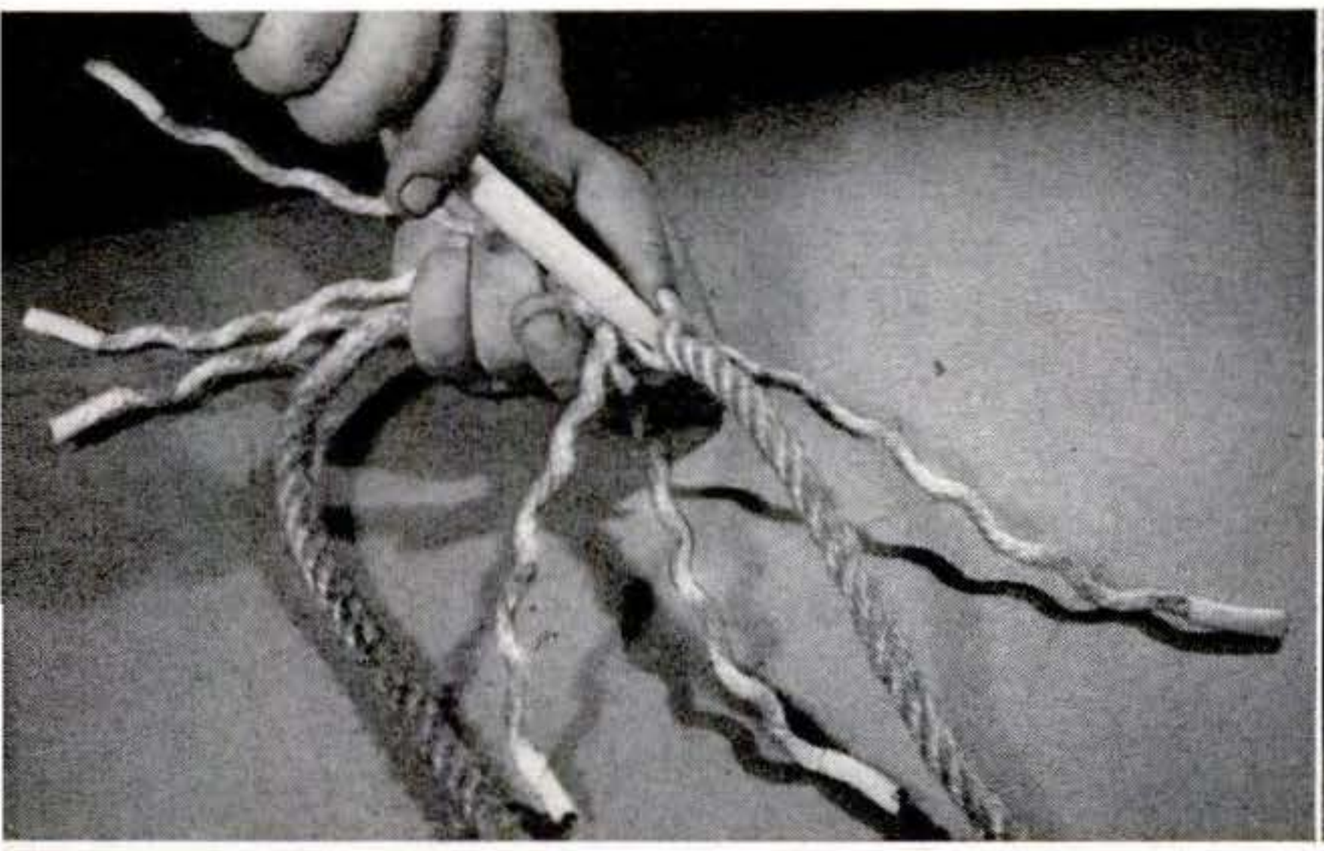


RISK OF SLIPPING KNOTS is avoided by wrapping load in slings. Endless sling (left) is loop of rope made by splicing ends together; double-eye sling (right) has eye at each end.

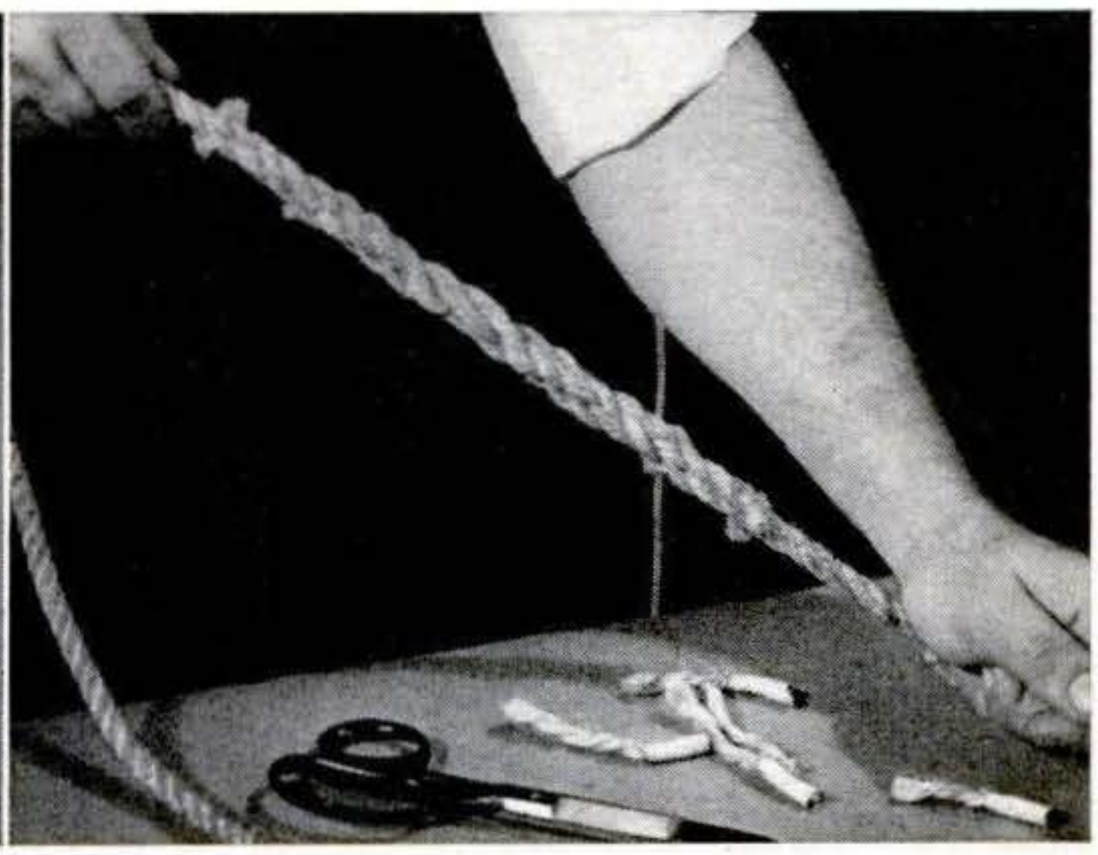


POINTED DOWEL opens path for additional three or four tucks, strands always being pulled tight after each tuck is completed.

SPLICE IS THEN TAPERED by thinning strands about one-third and continuing tucking with thinned strands until splice is completed.



TUCK STRANDS through, opening rope with pointed dowel. Tucks are made over strand to your left, under the next strand.



FINISH END SPLICE by thinning strands and continuing tucks for a total of eight or 10 tucks. Splice is 85 percent as strong as rope. END

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Poured concrete is smooth and trouble-free

Two Ways to Make Concrete Walks

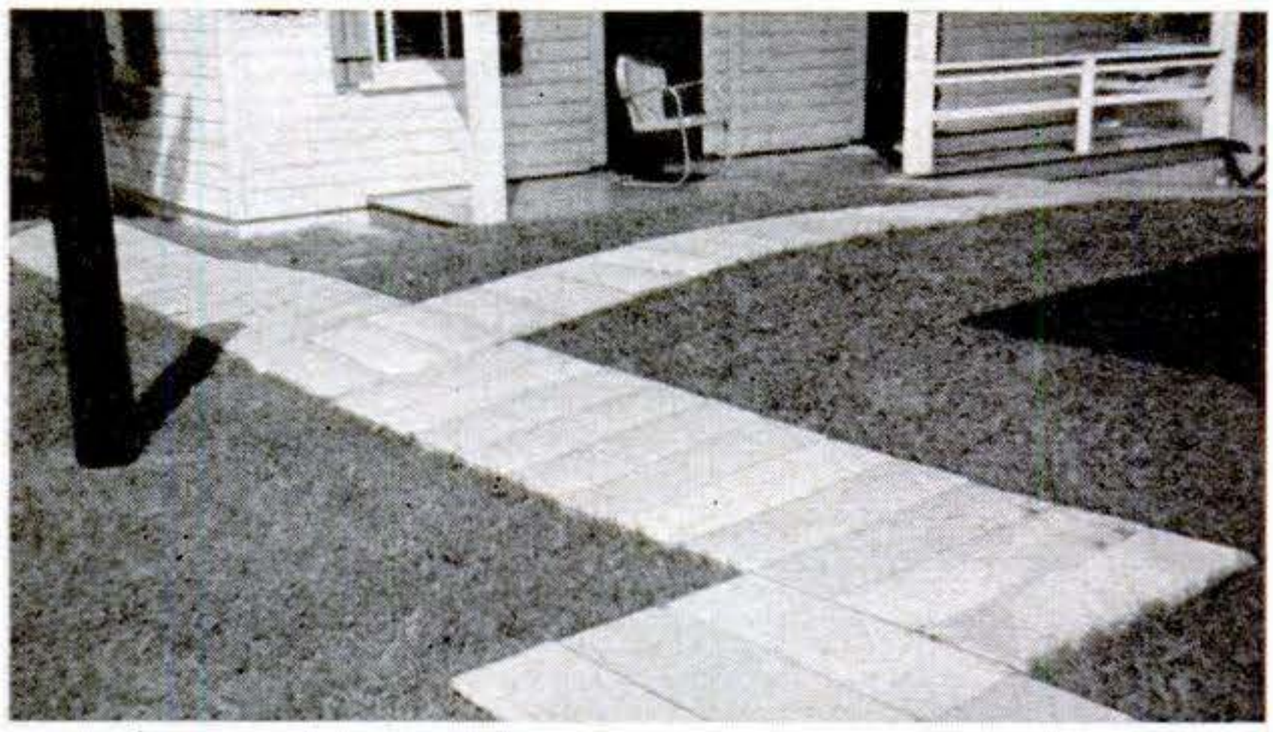
The old reliable paving still rates at the top on all points: looks, economy, serviceability.

YOU can't beat concrete for walks. Neat and attractive, it is generally also the cheapest, smoothest and most durable of paving materials. And it's easier to lay than you may think, whether you pour it in place or assemble precast blocks.

Poured concrete needs no gravel base if the soil is reasonably well drained and tamped firm. Scrap lumber makes the forms, and you can re-use it when you're through. For small jobs, concrete can be mixed in a wheelbarrow, but if you need very much, it is wiser to rent a mixer or have ready-mixed concrete delivered.

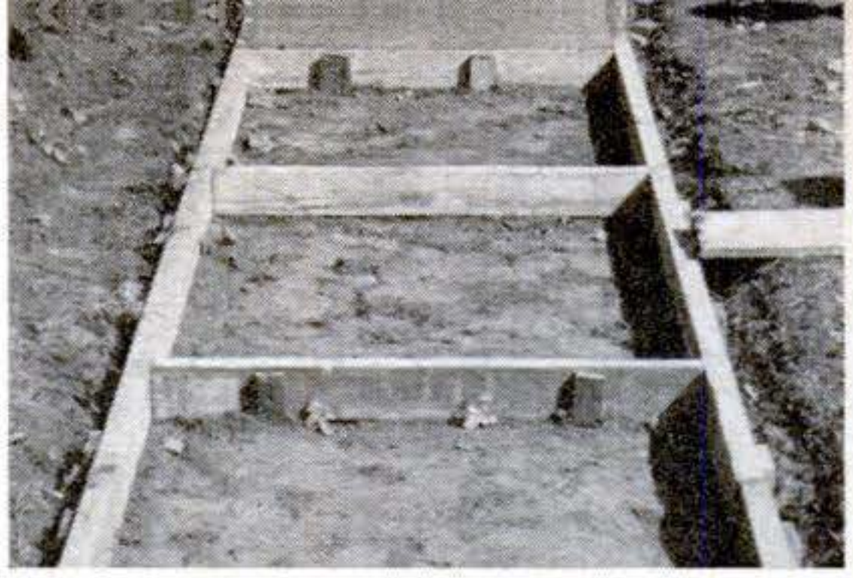
Precast blocks—available in many shapes—cost a bit more, but require less digging and no forms at all. For stumble-free smoothness, they should be laid on a ½″-deep base of gravel or cinders covered by ¼″ of sand. A layer of salt under the cinders will help keep weeds from edging through joints.

Blocks make quick-and-easy concrete walk

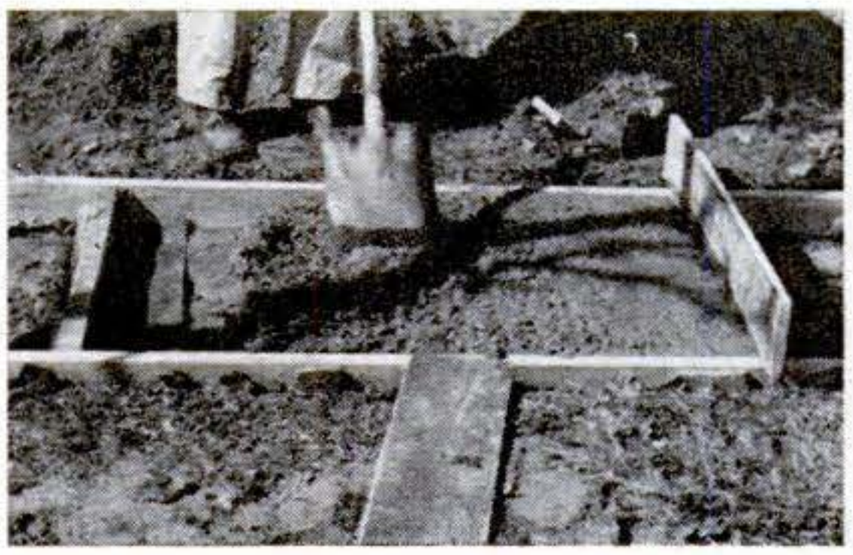


"SILO STAVES" is what these factory-made slabs of solid concrete are called. Their tongue-and-groove edges make a smooth joint, but they should be laid loosely enough to allow for expansion and drainage.

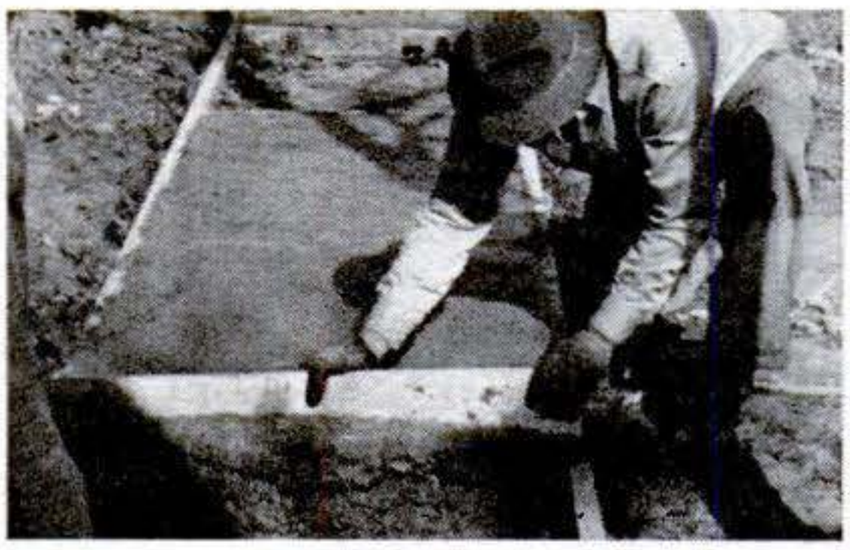
DIFFERENT-WIDTH WALKS for different uses are easily obtained by changing the direction in which the 10″-by-30″ slabs are laid. Ground need only be dug out about 1″ deep to allow for a shallow base and Staves.



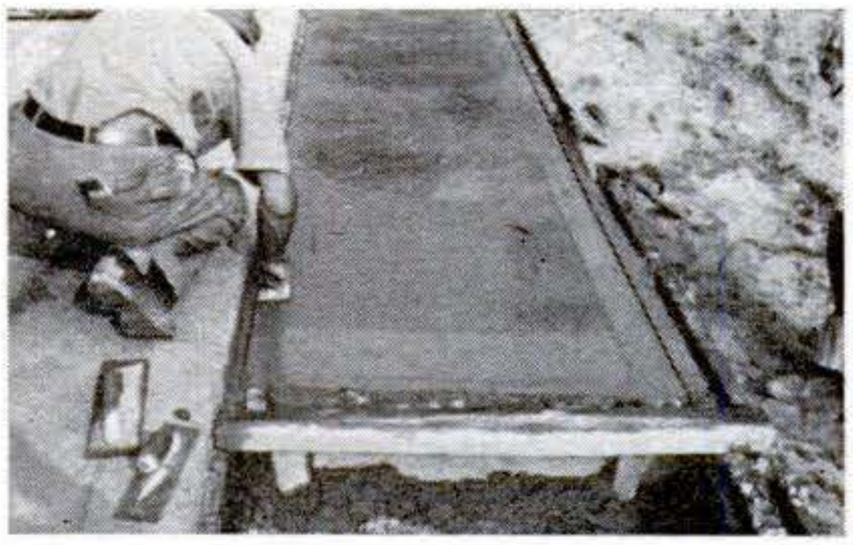
FORM for poured-concrete walk is two-by-fours, well staked, with lighter crosspieces to provide expansion joints. Ground should be dug out to bring walk at least 1″ above grade. Pitch slightly for drainage.



ALTERNATE SECTIONS are filled with mix, which is spaded against the form boards. After these are hard enough to be self-sustaining, remaining sections are poured.



STRIKE BOARD—any straight scrap—levels concrete after preliminary smoothing with shovel. Portland Cement Association recommends that same mix be used for the full thickness of the sidewalk.



WOODEN FLOAT worked over leveled concrete gives smooth surface with enough roughness for safe footing. Edge can then be grooved (above). Cover walk with wet paper for 72 hours to allow curing.

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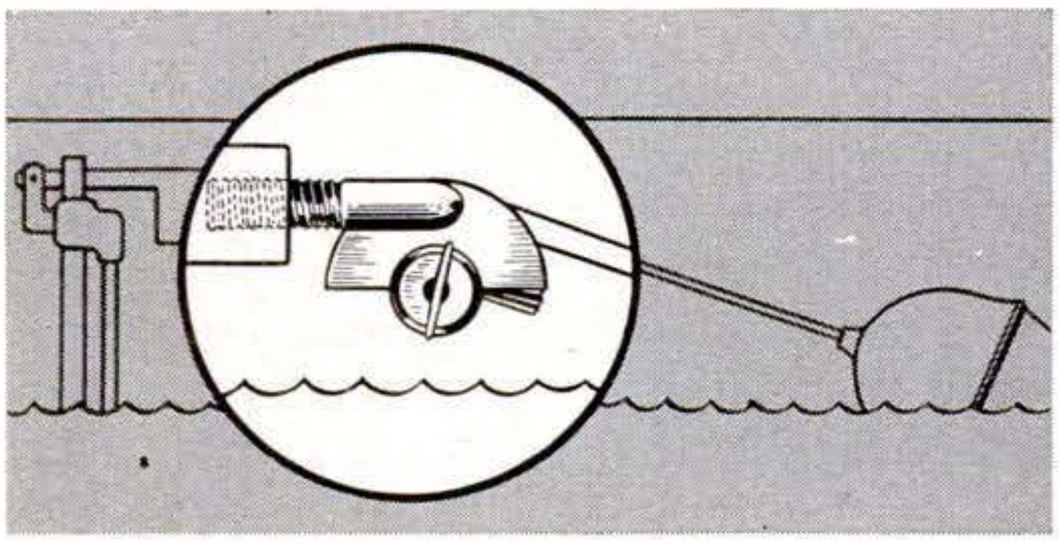
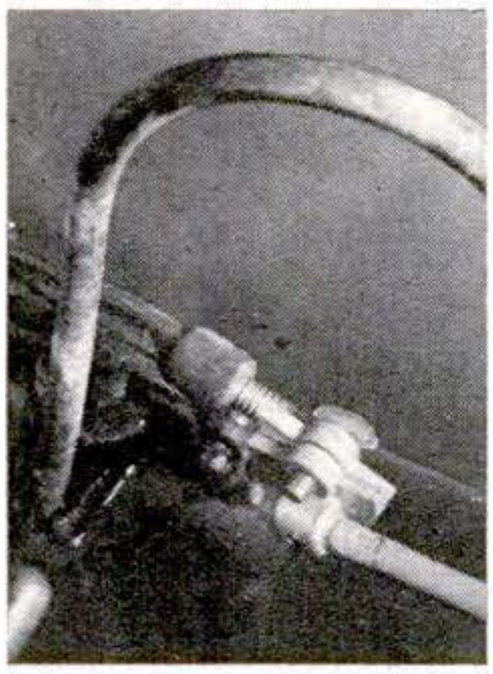
New for the Handy Man

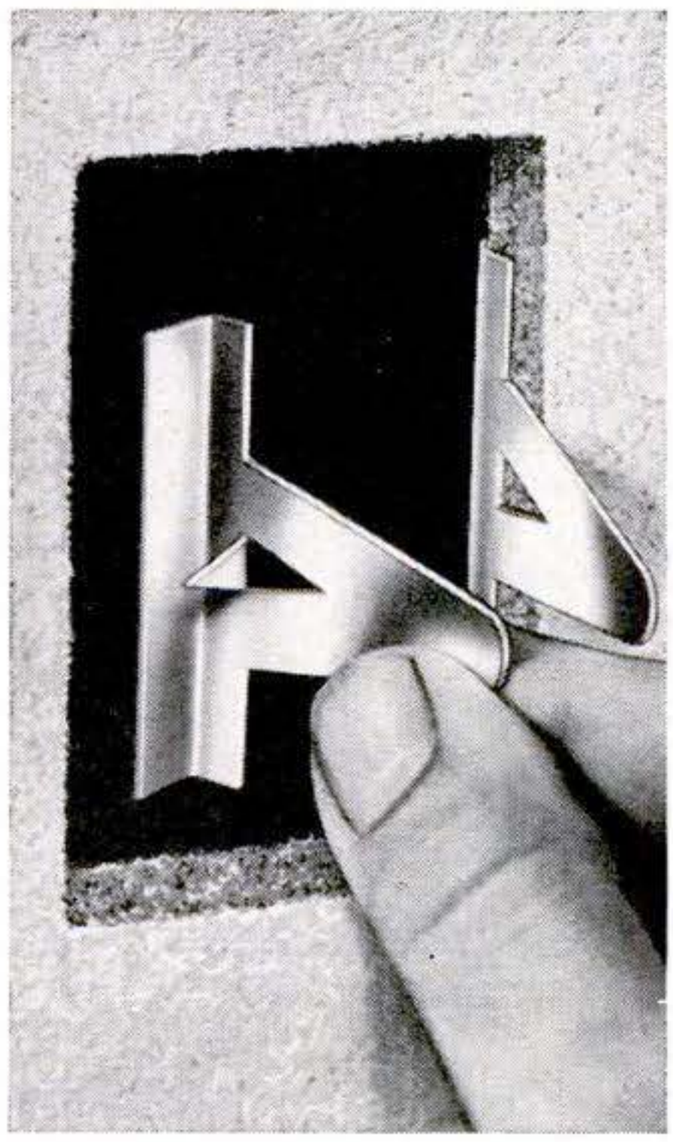
1. Can Keeps Brushes Clean. Several paintbrushes can be stored in this container and carried conveniently from job to job. A rack supports the brushes so that bristles are kept straight, and a plastic cover keeps out dirt. The rack and top will fit any standard rectangular gallon container so that the brushes can be quickly transferred from a can of cleaner to a clean, dry can for permanent storage.

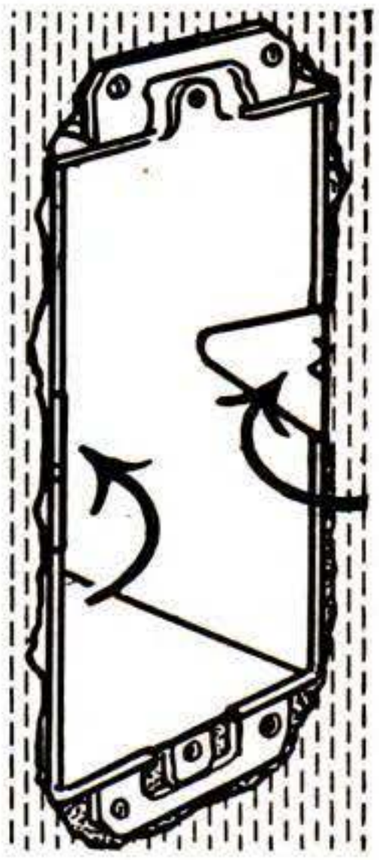
2. Wood Comes in Rolls. Only five-thousandths of an inch thick, this finely shaven wood can be put up like wallpaper with ordinary paste or applied as a decorative veneer to wood, metal, paper and other materials. Bonded to a thin paper backing, it is flexible, tough and takes wax, stain, varnish and other wood finishes. It comes in 10 different woods in 27½″-wide rolls from 32′ to 328′ long.





3. Adjuster Changes Float Angle. Leaky toilet valves can be quickly fixed with this float adjuster without bending the float arm or replacing the valve. The threaded adjuster screws between the valve and the float arm, permitting the float angle to be changed as the valve wears. It's also said to save water by enabling the float to close the valve at a lower level.





4. Brackets Hold Switch Box. These metal brackets will hold an electrical switch box in wallboard and other soft materials where there is no nearby stud for support. The sharp points on the brackets are first pressed into the wallboard's edge to give a good grip (left above). Then the box is set in and the tabs bent around it to hold it in place (right).

Further information on these products can be obtained from: 1. E. & J. Enterprises, Inc., 682 Bloomfield Ave., Verona, N.J.; 2. David Feldman and Associates, 504-6 Keith Building, Cincinnati 2, Ohio; 3. The Leonard Co., 506 Third St., Des Moines, Iowa; 4. Hilco Engineering Co., Genoa City, Wis.

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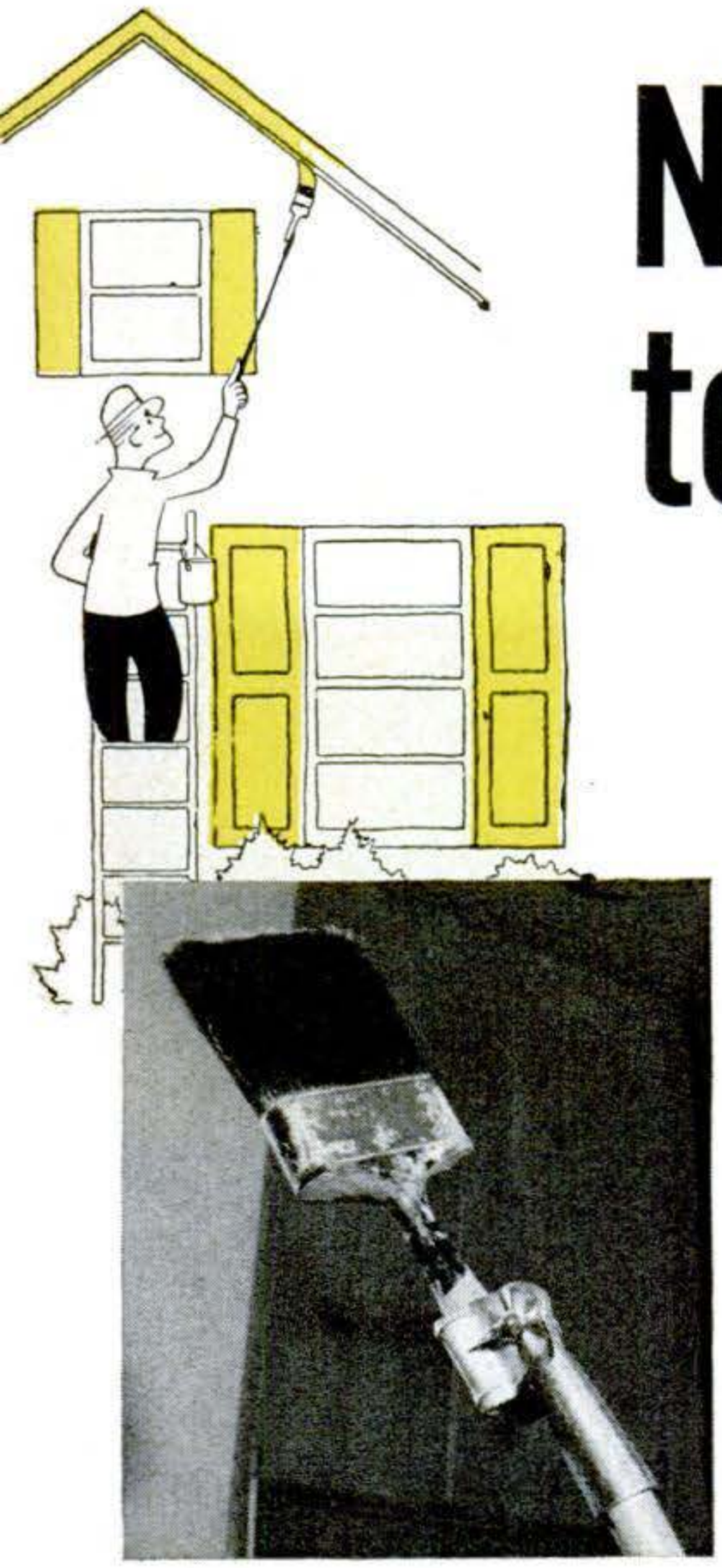


Now It's Easier to Paint a House

New paints for every purpose and ingenious tools to apply them help weekend painters get professional results.

By Bernard Gladstone

PAINTBRUSH ON A POLE spreads paint on the high spots without special ladders or scaffolds, is one of many new gadgets that help amateurs do a professional job. Holder above takes either brush or roller, fits on mop or broom handle and can be set at any angle to get in corners, crevices and under overhangs.

AMATEUR house painters never had it so good. Scores of new paints and gadgets placed on the market in the last few years make it possible for the weekend handy man to paint his own house almost as easily as a professional. From one-coat paints to disposable blowtorches, everything has been designed to make the job go faster, look better and cost less.

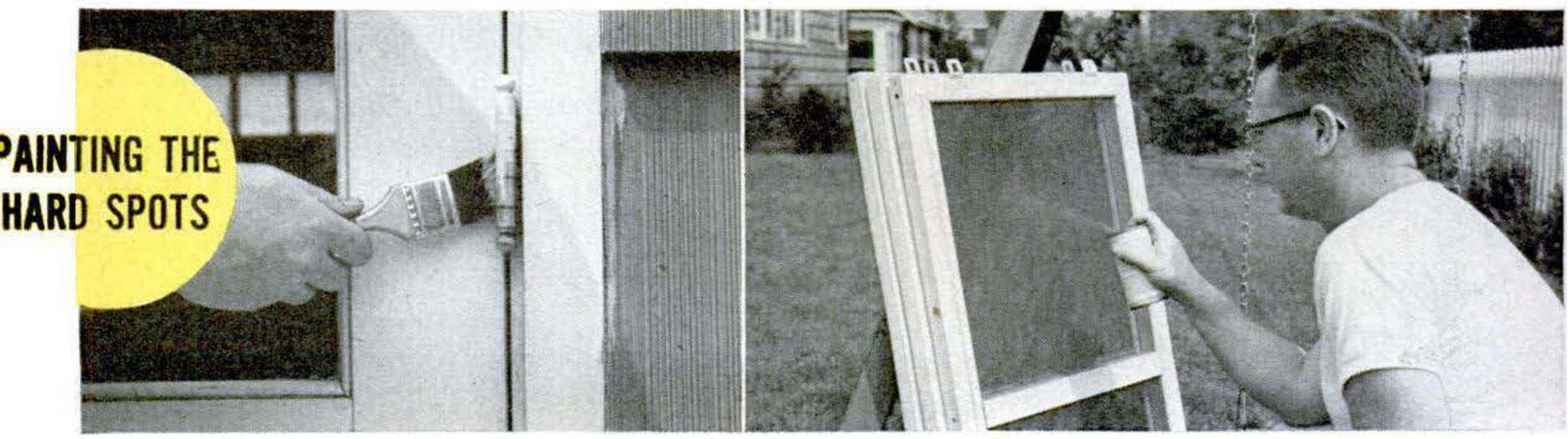
With the new outside rollers, you can paint an average-size house in a couple of days. Add an extension handle and you can roll a terrace without stooping down, reach a roof without leaving the ground. Specialized aids with built-in know-how tackle the hard spots for you.

Better still, you don't have to spend hours getting ready and hours cleaning up afterward. Premixed paints, electric-drill attachments and self-dispensing calking guns make short work of preparation. Cleaning up is a soap-and-water job for the rubber paints, or a quick dip in special cleaners for the oils. Disposable dropcloths and paper paint pails are used once and thrown away.

Here are some of the tools of the amateur's trade that make it easier to paint your house than ever before—not the way the pro does perhaps, but with much the same results.

BADLY RUSTED METAL can be covered over with this new paint, saving work of cleaning metal first. Paint stops rust chemically, comes in several colors and can be used as finish coat or as undercoat for regular paint.

SPRAY CANS get in where brushes won't reach, are easy way to paint screens, shutters, iron grillwork. Screens stacked this way can be sprayed three or four at a time to save paint. Spray screens from both sides.



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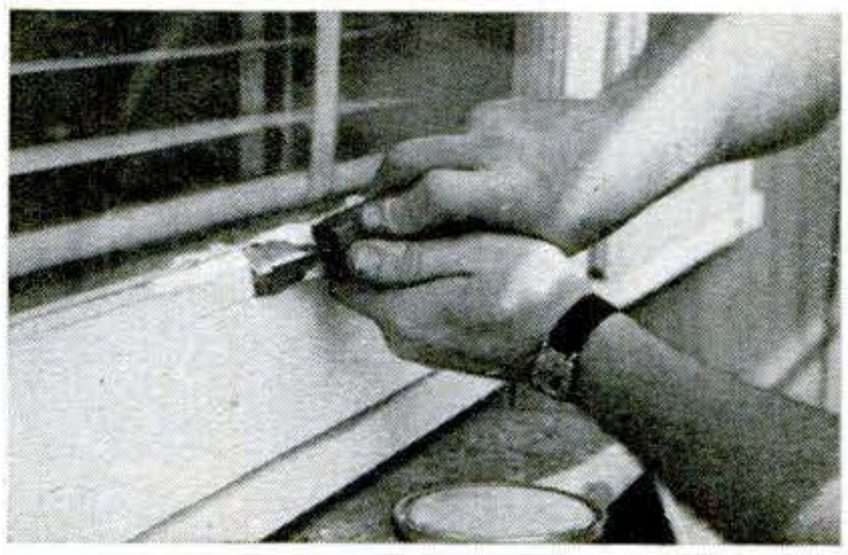
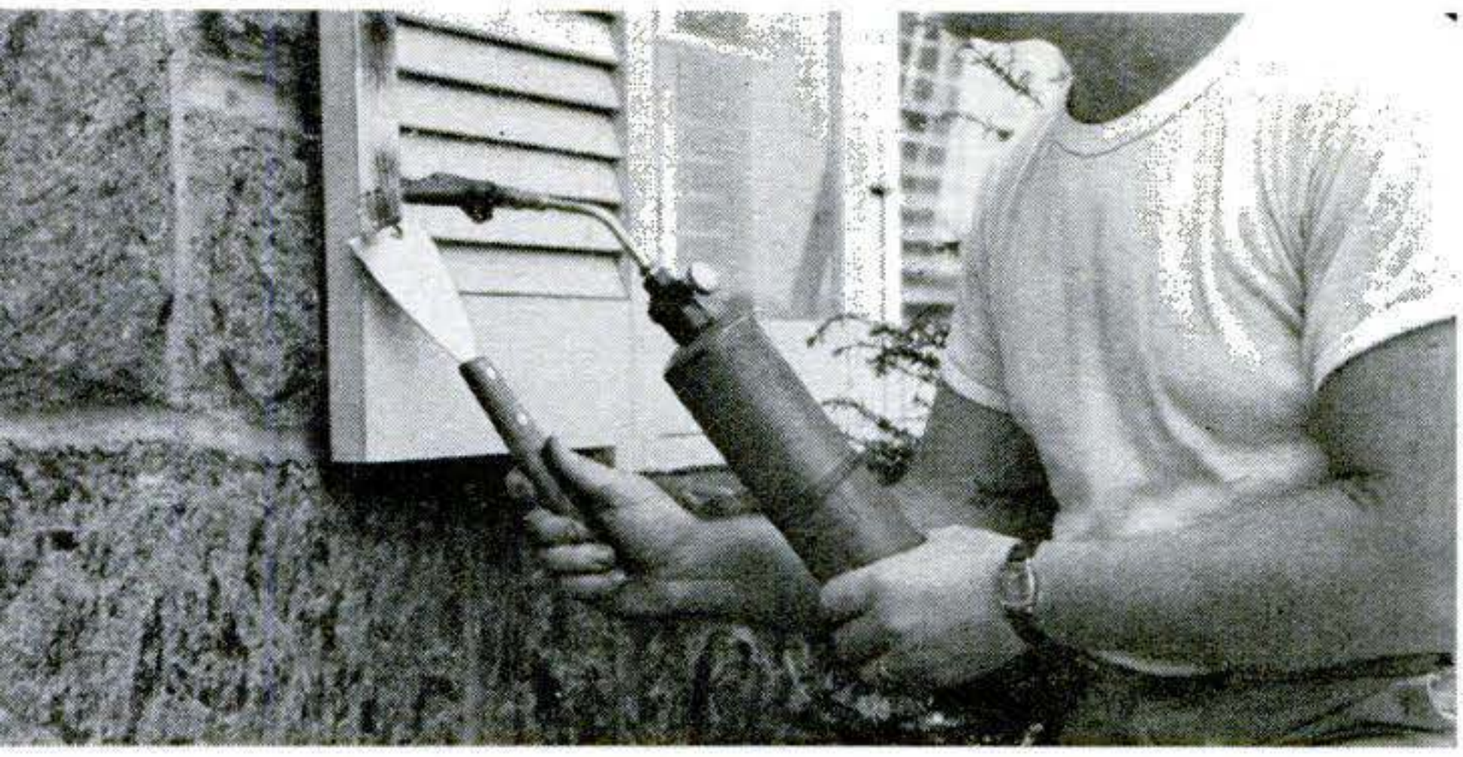
ROUGH SPOTS on old paint are quickly smoothed down with sanding wheel in electric drill. Same treatment with wire-brush wheel (in foreground) takes rust and scale off metalwork. Cracked and peeling paint can be removed with several types of hand scrapers. Small scraper at left above gets in tight spots.

CALKING GUN fills cracks around windows, doors, needs no cleaning since barrel is disposable cartridge, replaced by refill. Calking compound can be painted over immediately.



V-SHAPED PUTTY KNIFE spreads smooth, professional bead of putty along window sash. Loose old putty should be removed and window primed before new putty is applied.

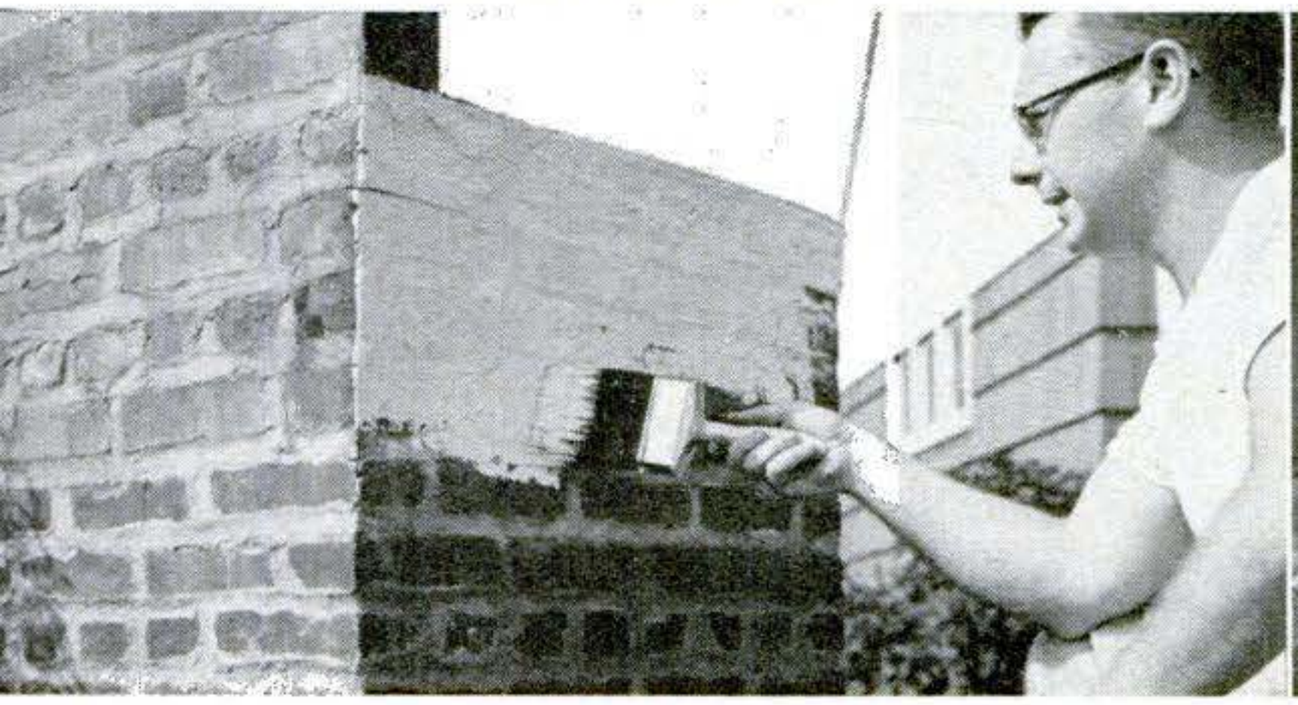


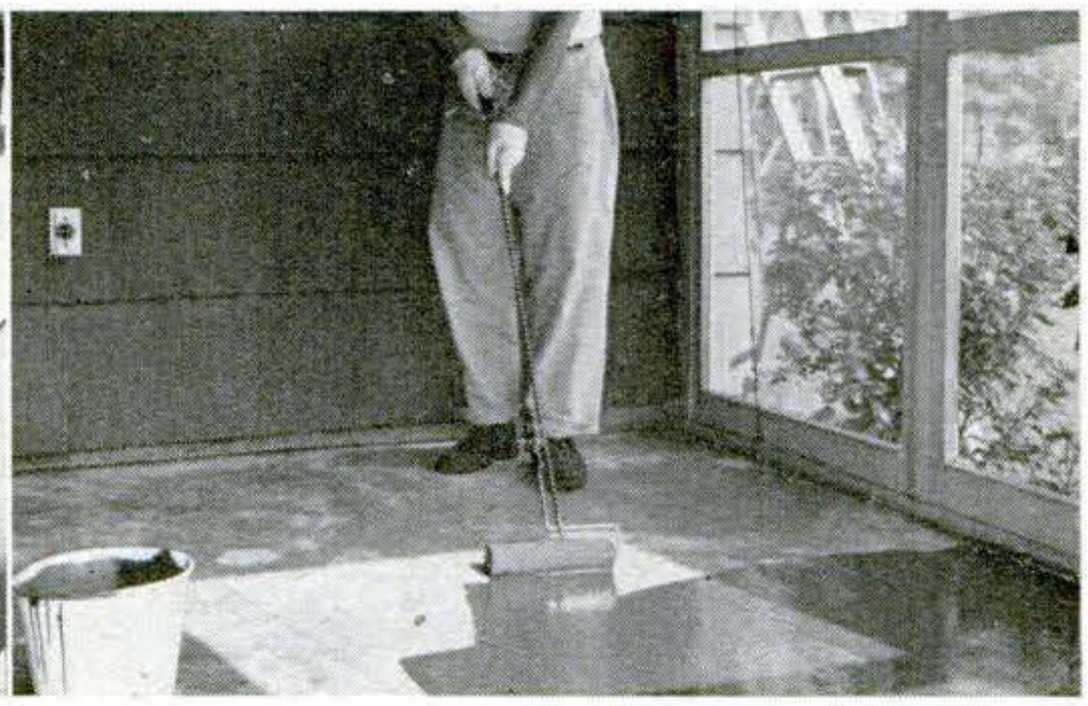
DISPOSABLE BLOWTORCH takes off heavily built-up or alligatored paint, needs no pumping or priming, is simply fitted with new tank when old one runs dry. Wide-mouth burner tip spreads flame over large area. Long-handled scraper keeps fingers out of way.

EXTENSION RING fits top of paint can, making it easy to mix paint and add thinner without spilling. Ring has its own lid so it can be left on and paint kept covered.

RUBBER-BASE MASONRY PAINT lets you put a quick coat on brick, stucco or cement without mixing up powders or using special undercoats. It comes ready to use, is waterproof, can also be used on asbestos shingles.

YOU CAN ROLL PAINT ON a concrete porch or outdoor terrace with an extension handle and this rubber-base enamel. Enamel is tough, wears better than ordinary concrete paints, is not affected by moisture in exposed slabs.





Please turn the page for more paint photos.

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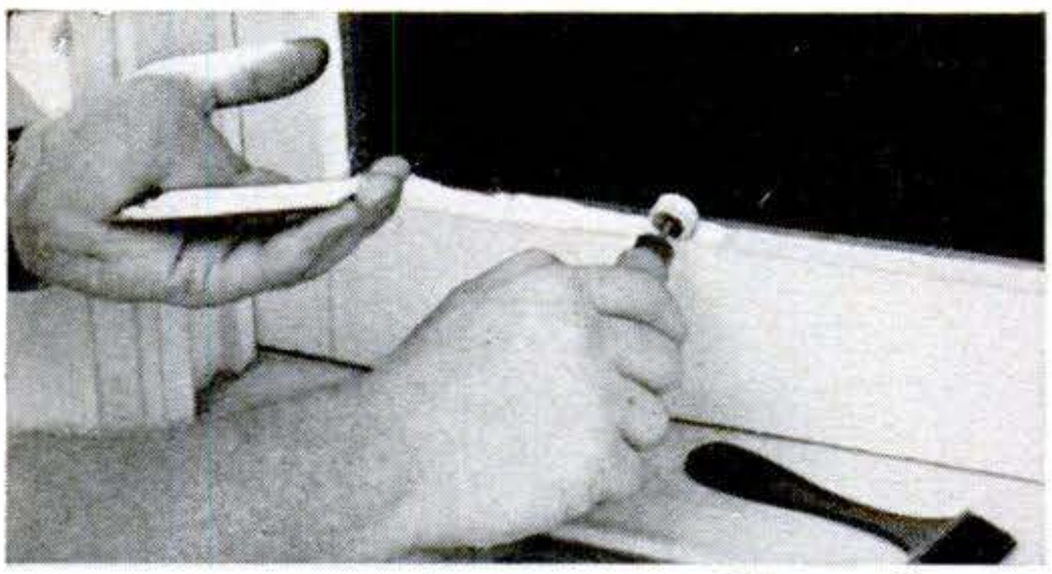
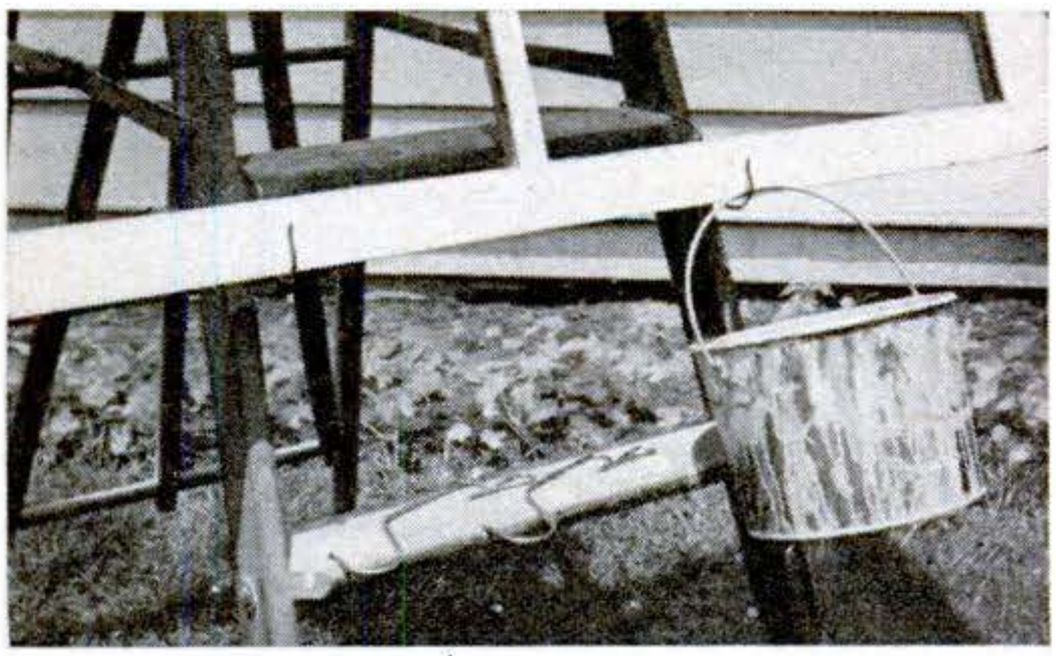
APPLYING THE PAINT

EXTERIOR ROLLERS now let you paint outside with the same ease that you use them inside. Small doughnut-shaped roller (left) gets in corners, under edges of clapboards and between joints in vertical siding. Then large roller is used to fill in broad areas (right). Special long-nap roller also puts paint on brick, stucco and other rough-surface masonry. Paint tray clamps to side of ladder, can be adjusted to any angle.



MINIATURE ROLLER lays narrow ribbon of paint on window sash without getting paint on glass. Roller comes with its own tiny paint tray, has metal tip that rides against glass to keep paint from smearing. Another type of sash painter (on window sill) has plush pad set in plastic handle. Pad is saturated with paint, then wiped along sash with plastic edge held against window to keep paint off glass.



EASEL FOR PAINTING SCREENS and storm windows is made by clipping special wire hooks to stepladder rung. Hooks also serve as paint-can holders for working atop ladders.

YOU CAN STAND ON GROUND and still reach first-floor roof overhangs with roller on extension handle like this. You paint as fast as you walk, don't have to keep moving ladder. Same extension will reach second-floor overhangs from stepladder.

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TRICK LADDER does several jobs in one. As stepladder (above), it stands 7′, lets you reach well above first-floor line. By locking one half to other, it converts into 13′ extension ladder (below), for reaching high spots. Halves can also be used separately as short ladders so two persons can paint at once.

CLEANING UP

DISPOSABLE DROPCLOTHS keep paint off shrubs and walks. Made of paper, they're cheap, light, won't damage bushes and flowers, can be used several times.

ROLLERS are quickly cleaned in tank of special fluid. Roller is simply dropped in and tank shaken like cocktail for one minute. New ring-shaped scraper is then slid along roller to squeeze out the excess cleaner.

PAPER PAINT PAILS save buying and cleaning expensive metal ones, are handy for mixing. Costing only a few cents, they're used once, then thrown away.

WATERLESS HAND CLEANER takes off both oil- and rubber-paint, will not irritate skin as solvents may. Paste is simply wiped on hands, then wiped off, taking paint with it. END

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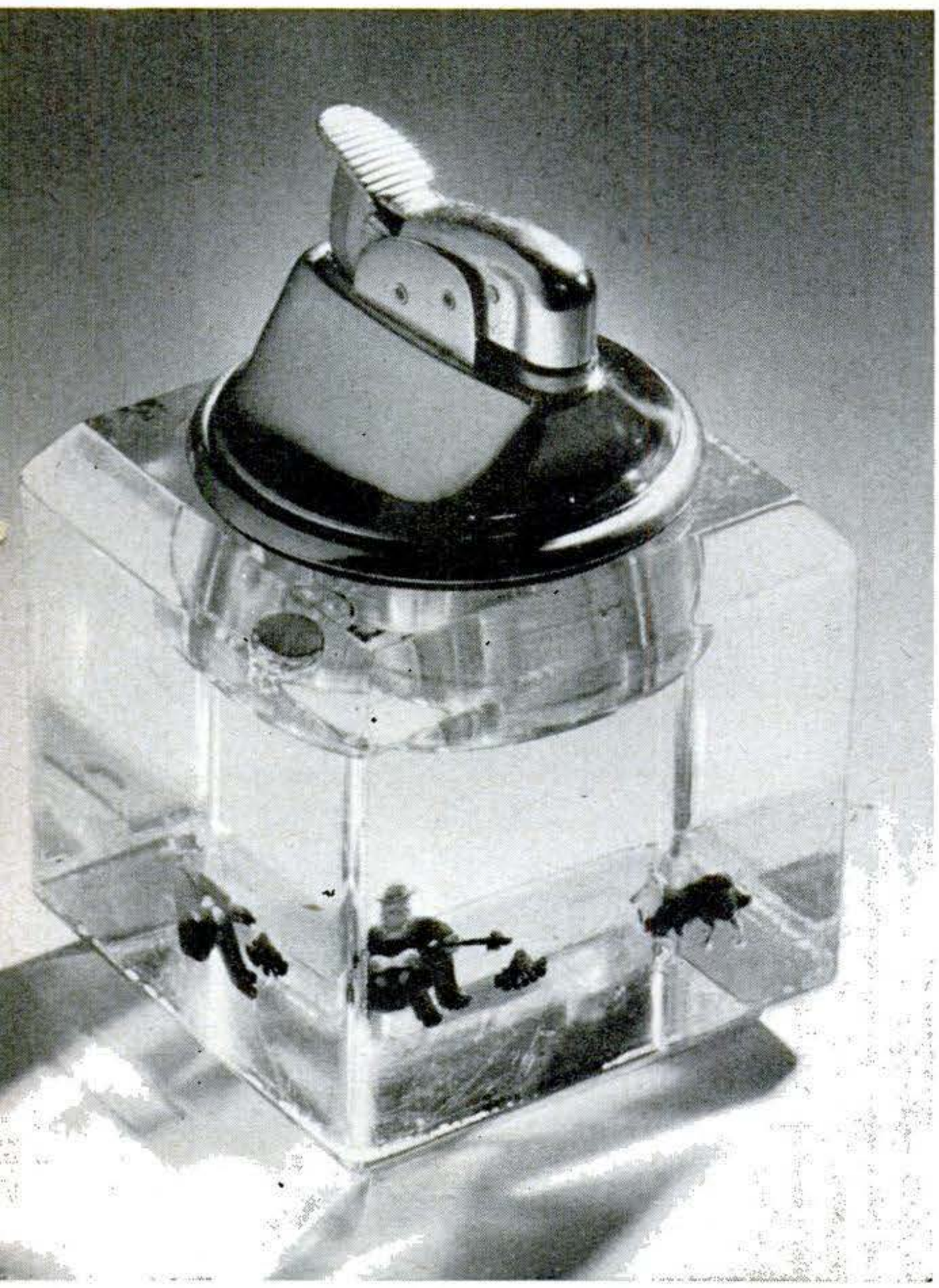
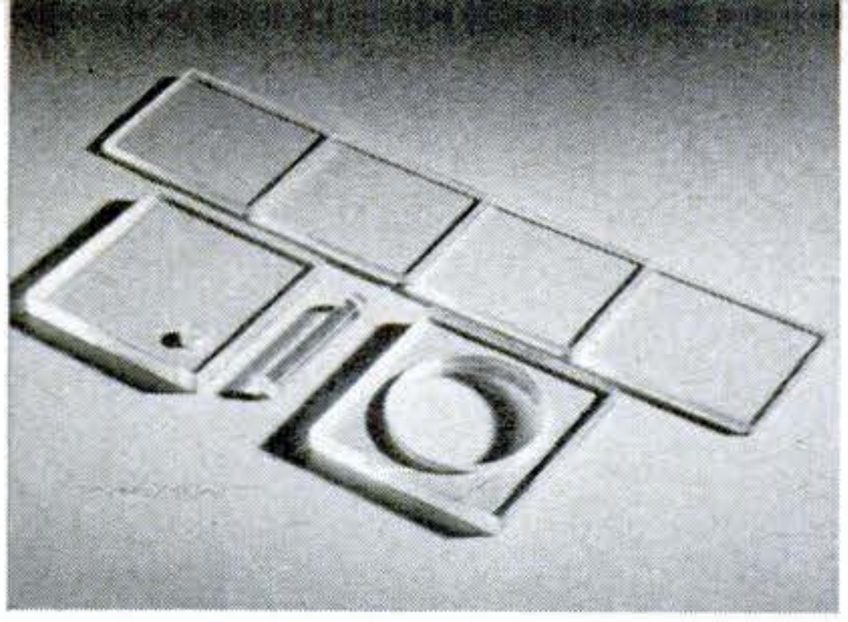


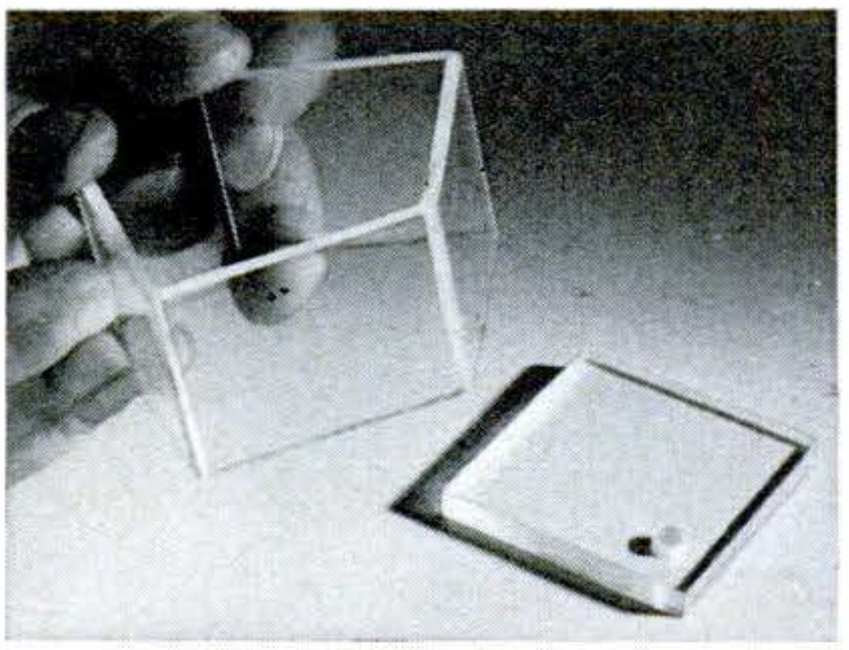
Plastic Box Makes Tricky Lighter Base

Filled with mineral oil, it looks like a solid cube, and you see the ornamental figure twice.

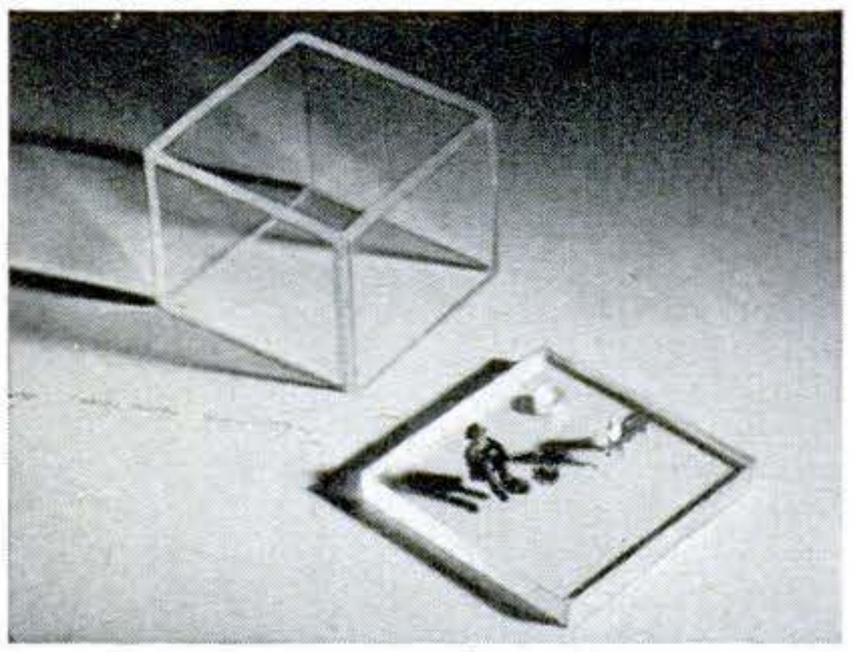
ALTHOUGH the figures you see in the base of this table lighter appear to be molded into a solid block, they are actually submerged in a hollow plastic box filled with mineral oil. There is only one hobo in the oil-filled box, but the refracted image appears on two sides. This is because mineral oil has the same refractive index as clear plastic—both bend light rays to the same degree. Without the oil, it would appear to be just a figure in a plastic box. The lighter came from a craftwork supply house. The box was made from sheet plastic.—*M. J. Moch, Jamaica, N. Y.*



CUT PARTS FIRST. Sides of box are bent from long strip with V cuts made with saw set at 45°. Small hole in bottom is later plugged with rod.

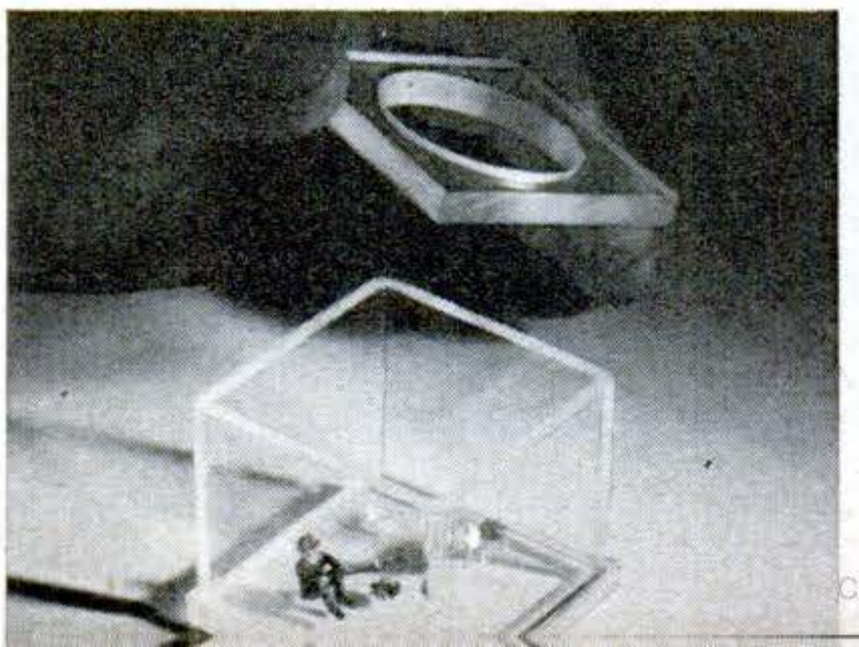


BEND SIDES. Heat each V cut gently until soft, then bend 90° to form box. Bring ends together and check squareness. Then cement them.



CEMENT FIGURES to bottom and cement sides in place. Dip edges in shallow tray of solvent; press parts together firmly for clear joints.

CEMENT TOP OVER SIDES and, when dry, bevel the top and bottom edges to conceal the joints. Sand smooth and buff clear. Force lighter into hole in top, turn upside down, fill with mineral oil, and allow to stand until all bubbles rise. Then drive a ¼" plug into the hole, cut it flush, sand smooth and buff lightly to avoid warming and expanding oil.



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POWER PLANT at right drives a balsa plane into the sky as seen in the dramatic picture below. A wire clip holds cap on motor case and aligns motor in bracket. A wood strip represents the keel.

Turboprop Flies Model

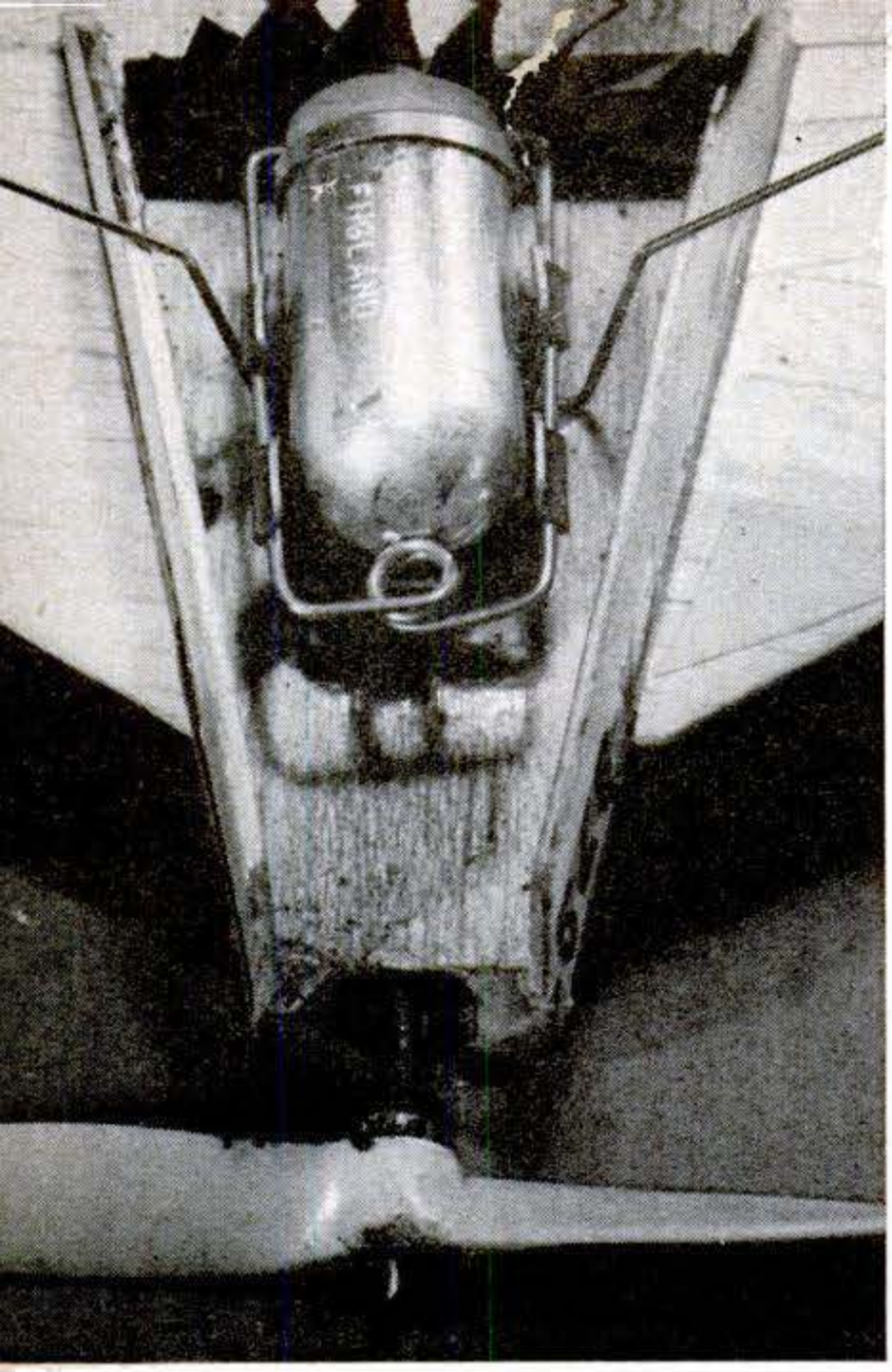
Gases from a miniature jet engine whirl a tin-can turbine which in turn spins the prop to keep the plane in air.

By Roy L. Clough Jr.

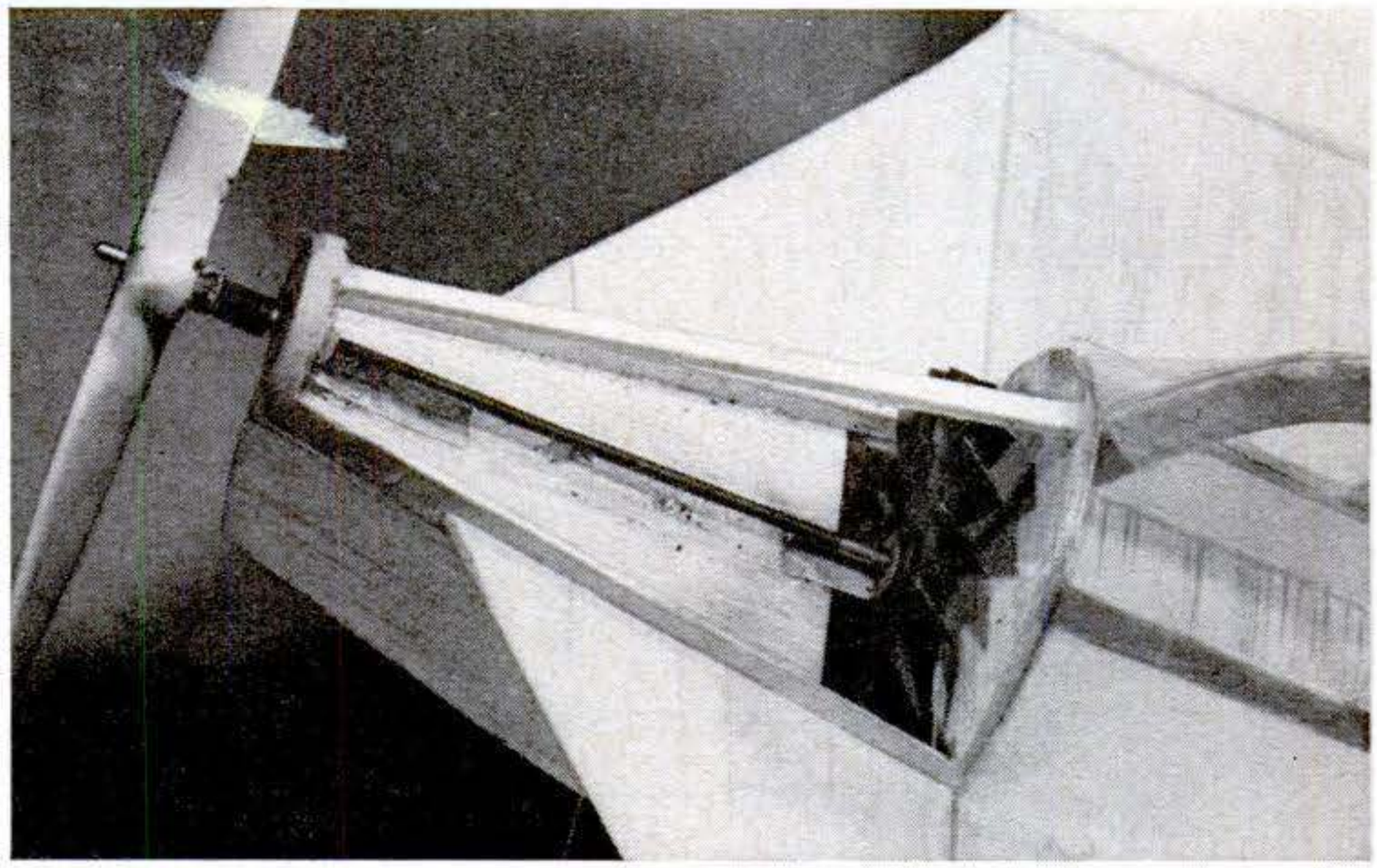
THE hissing power of a miniature jet engine is harnessed by a turbine to spin the prop on this model plane—just as on a real turboprop airliner. The prop does most of the pulling, but the jet thrust helps, too. Flights of about 150 feet can be expected.

Power plant. The jet power is supplied by a Jetex 50 solid-fuel motor, available in model-supply shops. A small pellet of compressed fuel burns rapidly, emitting exhaust gases under pressure through a tiny hole in the metal case.

Construction. Four 1/16″ balsa bulkheads (stations A, B, C, D) cemented to a flat keel shape the fuselage. The wing, cut in one piece, is laid across the keel and



A RACKET is set at a slight angle to left (looking f nose). It also secures the landing gear. A s that comes with motor insulates the keel.



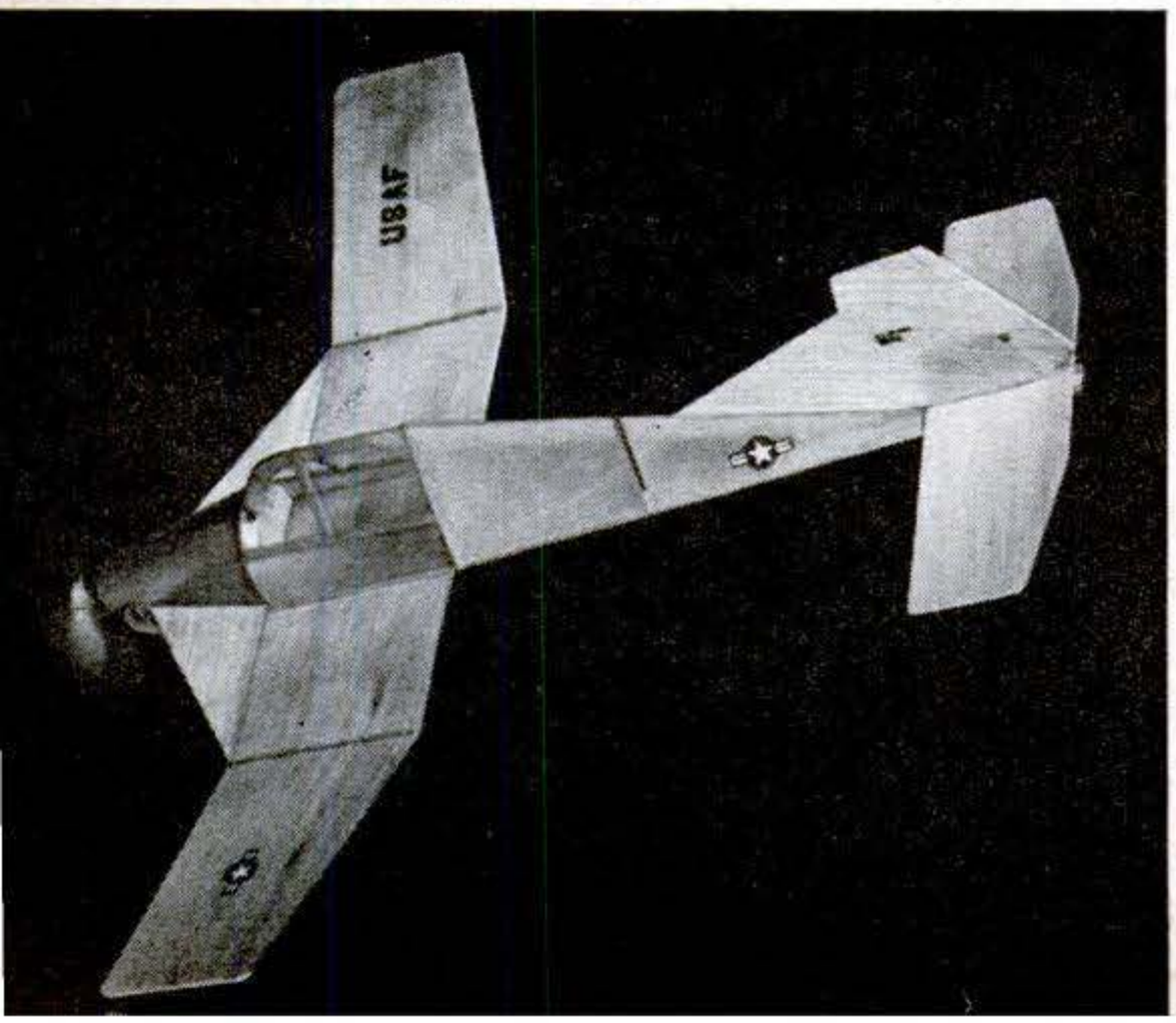
PROP-SHAFT BEARINGS, cut from tin-can stock, are cemented to the top surface of keel. Opening is cut in keel for turbine after fuselage stringers are in place.

cemented in place. Dihedral is added by scoring, bending and reinforcing the bend with cement.

Rudder, stabilizer and wing fillets are cemented in place after the fuselage is covered with tissue; cowl cheeks are added after installing the motor bracket and landing gear. The bracket is set off-center and at a slight angle, to reduce the side thrust of the jet as the gases are deflected by the turbine vanes.

Prop shaft and turbine. Bearings for the prop shaft are cut from tin-can stock and cemented to the top surface of the keel on the centerline. The turbine is made by cutting 16 vanes in a 1 9/16″ tin disk and twisting them about 45°. It is then set into an opening in the keel and soldered to the back end of the propeller shaft. The propeller is forced on a short length of rubber tubing slipped over the end of the shaft. This will hold it in place for flying, yet permit easy changing of props to determine the best pitch.

FROM ABOVE, the model looks like this. The wing is cut from 1/16″ sheet balsa. Dihedral is obtained by scoring and bending.



Flying. The trim of this model is unusual because the center of gravity shifts during flight. It should be balanced for a floating glide without a fuel pellet in the motor. A wedge pushed under the stabilizer will keep the nose up if needed.

Flying under power with the weight of the fuel holding down the nose, the model will travel on the level for some distance, then go into a gradually steepening zoom as the fuel pellet is consumed and the motor peaks.

The rudder is bent to the right a bit to counter the jet deflection, which tends to force the plane to the left. Best bet is a straight flight or a gentle left bank as gyroscopic forces of the turbine and prop tend to raise the nose in a left turn and depress it in a right turn.

Cautions. The prop should not be held, once the jet starts perking; heat concentrated on the turbine might melt the solder that holds it to the shaft. If the plane noses in, it should be picked up immediately to let the turbine spin. A thin solution of sodium silicate (egg preservative) or sal ammoniac painted inside the cowl cheeks will keep them from being scorched. END

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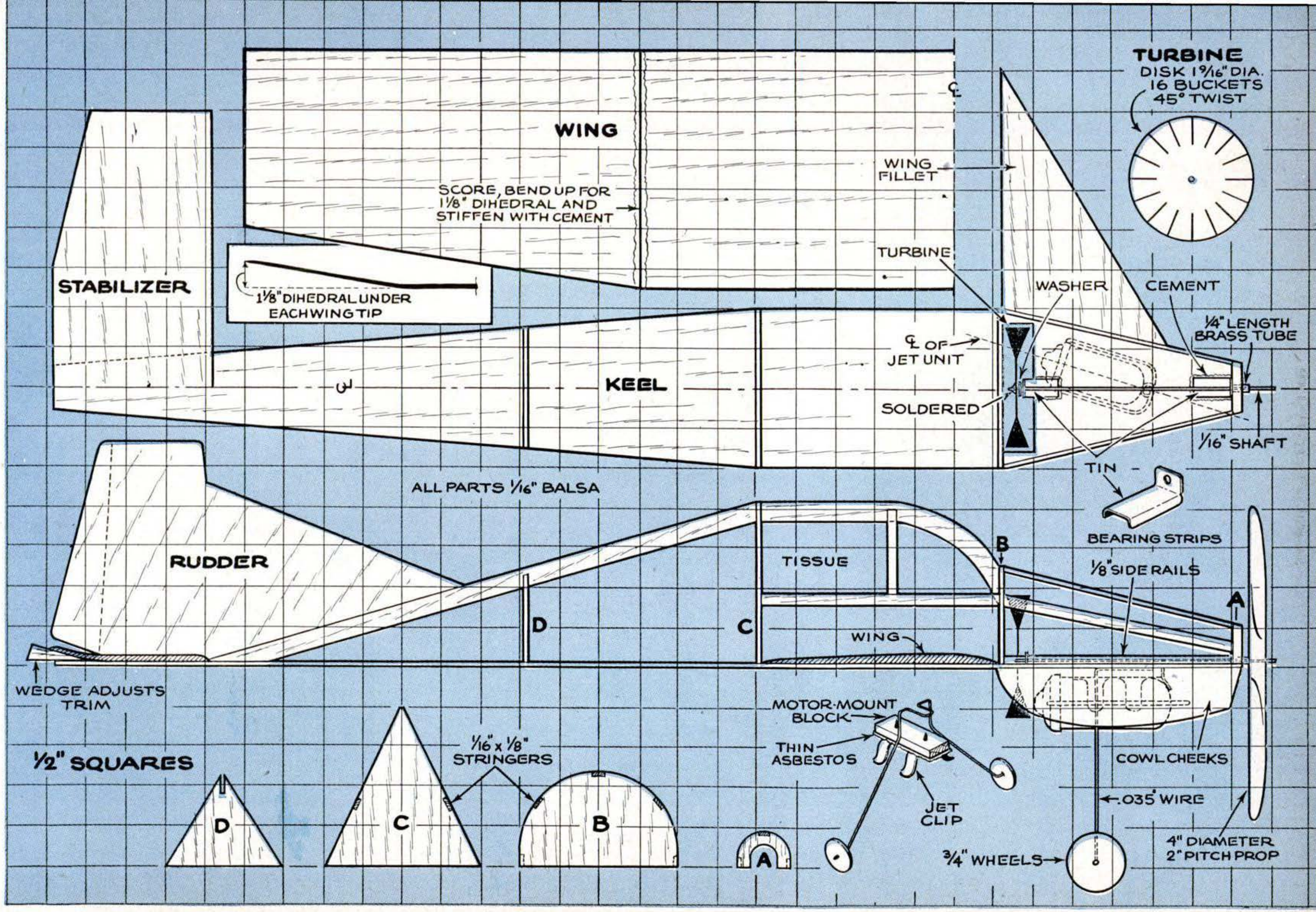

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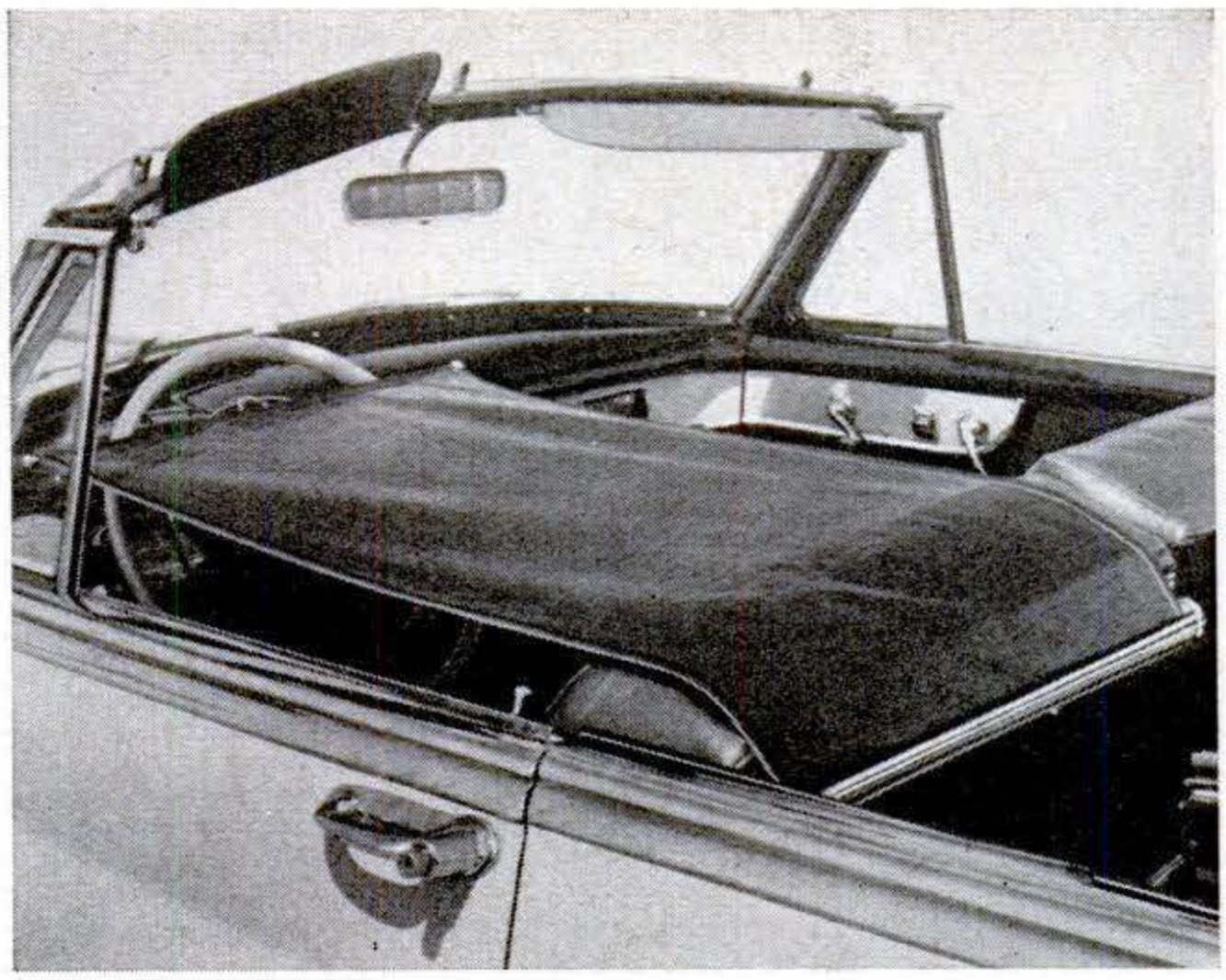
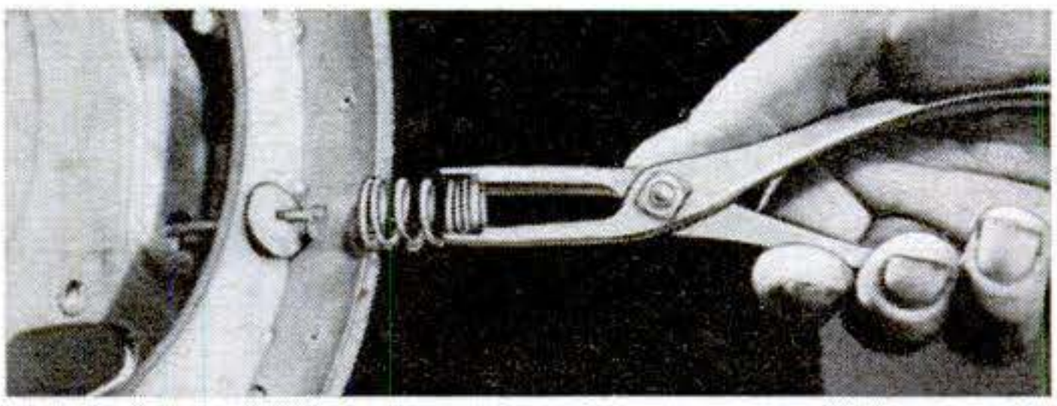
New for Your Car

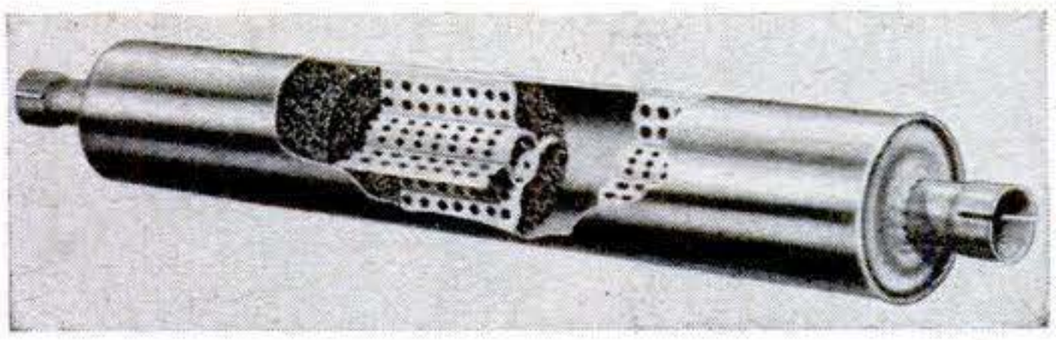


1. Shade Keeps Convertible Cool. You don't have to come back to a scorching seat every time you leave your convertible on a hot, sunny day. Just pull out this shade, hook it to the steering wheel, and the seat will be cool and comfortable when you return. When not in use, the shade rolls up into a chrome-plated metal cylinder on the back of the seat. It also keeps out dirt, prevents dew from forming on the seat, and saves wear and tear on the regular top since it need not be raised and lowered as often.

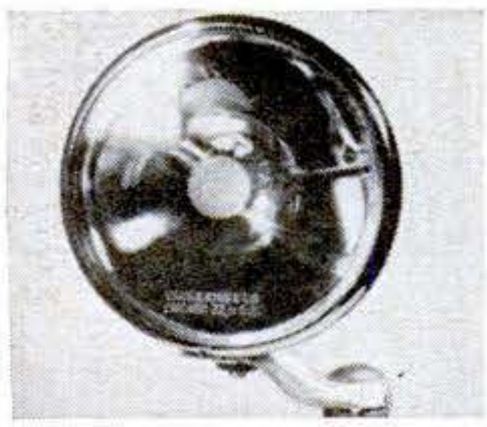
2. Light Warns of Brake Failure. If your brake fluid falls below normal level, this dash light flashes a warning, giving you time to pull in for a checkup before an accident occurs. The light is triggered by a float-actuated switch that's screwed into the master cylinder's filler hole replacing the regular filler cap. If the fluid level falls, the float drops, closing the switch and lighting the lamp.



3. Pliers Remove Brake Springs. The tiny hold-down springs in brake assemblies can't slip or spring out of place with these special pliers. The hooked tips grip the sides and a circular tab holds spring and washer firmly together so both can be removed or inserted with one hand.



4. Power Muffler Wears Longer. This new muffler is said to have the high-power and fuel-saving advantages of straight-through types without the disadvantages of lost packing and hot spots that necessitate frequent replacement. The steel packing is held firmly in place by four perforated dividers that keep it from settling to the bottom or sifting out the exhaust pipe, and permit even heat-dissipation. Another model is available with glass-fiber packing instead of steel.



5. Aircraft Spotlight Made for Car. You can now get a spotlight for your car that's just the same as the landing lights used by airplanes. The sealed-reflector lamp produces 200,000 candle power and operates on a 12-volt electrical system. A 6-volt model is also available.

Further information on these products can be obtained from: 1. Paramount Leather Goods, 779 Towne Ave., Los Angeles; 2. Wagner Electric Corp., 6400 Plymouth Ave., St. Louis; 3. Thorsen Tools, Emeryville, Calif.; 4. National Engineering Corp., 1122 W. Venice Blvd., Los Angeles; 5. Charles E. King & Co., 960 W. Chicago Ave., Chicago.

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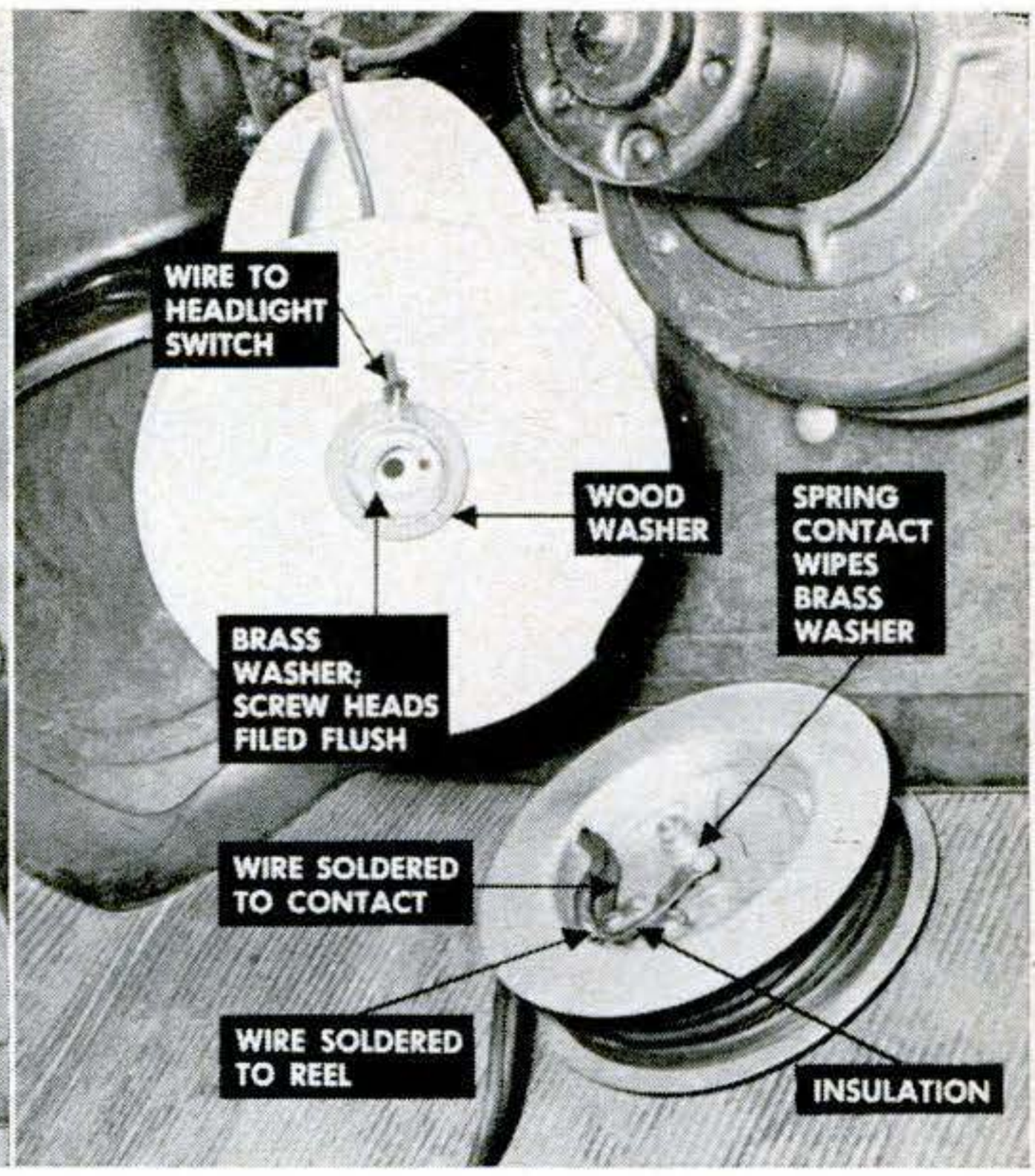
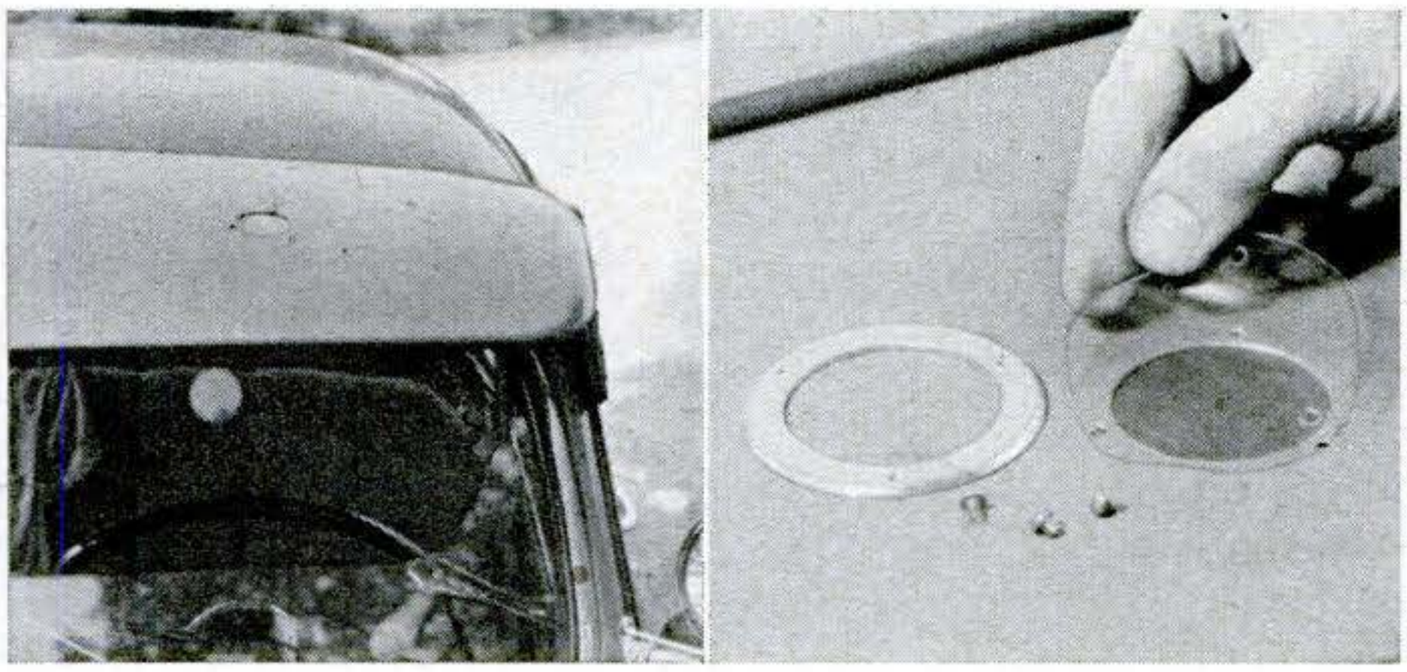


This Auto Trouble Light Winds Itself Up on Reel

I GOT tired of plugging my auto trouble light into the cigarette-lighter socket every time I wanted to use it. Now I have a light that's permanently connected, ready for instant use, and it winds itself in and out, saving fussing with a long, tangled cord. First I bought a spring-loaded clothesline reel, removed the line and wound on the light cord. On the inside of the cover I screwed a wood washer for insulation and a brass washer on top. A spring contact on the reel, connected to one lamp lead, wipes the washer as the reel turns. The other lead is grounded to the reel. From the washer I ran a wire to the hot side of the headlight switch and screwed the reel to the firewall to complete the circuit.—*R. L. Hanson, Middletown, R. I.*

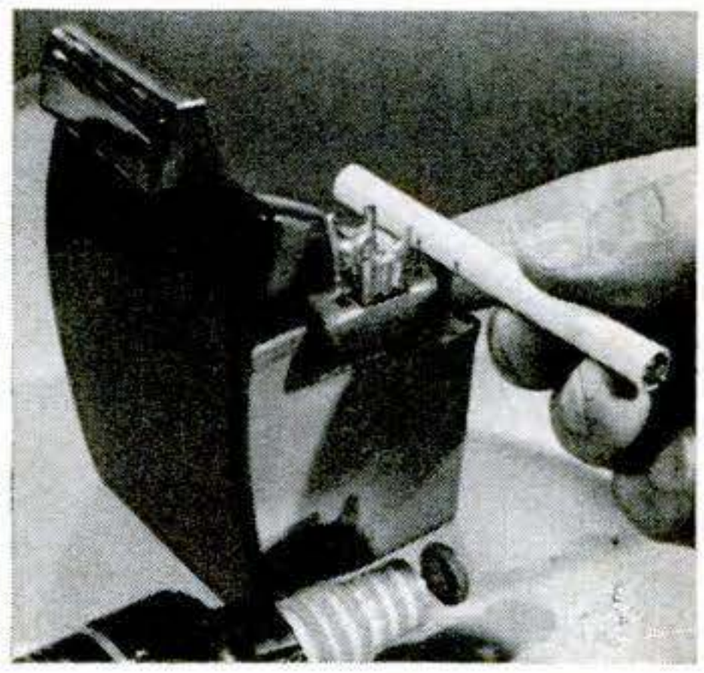


Peephole in Visor Spots Traffic Light

A SMALL hole in a sun visor (above) will make it easy to see overhead traffic lights that are often hidden by the visor. Locate the best spot by sighting at an imaginary light, then cut a 2″ hole in the metal visor and smooth the edges. Cut a circle of clear plastic slightly larger than the hole and make a retaining ring for it out of aluminum or other nonrusting metal. Drill and tap the ring for machine screws and mount the sandwich on the underside of the visor. A small drain hole drilled in the plastic at the lowest point will keep water from collecting.—*W. E. Burton, Akron, Ohio.*

Clip Holds Cigarette

A SPRING-TYPE paper clamp will make a convenient holder (below) for a lighted cigarette while you're driving. Grind away half of the eyelets, enlarge the holes if necessary and clip the clamp to the ash tray. Keep the holder in the glove compartment when not in use.—*Ken Murray, Colon, Mich.*



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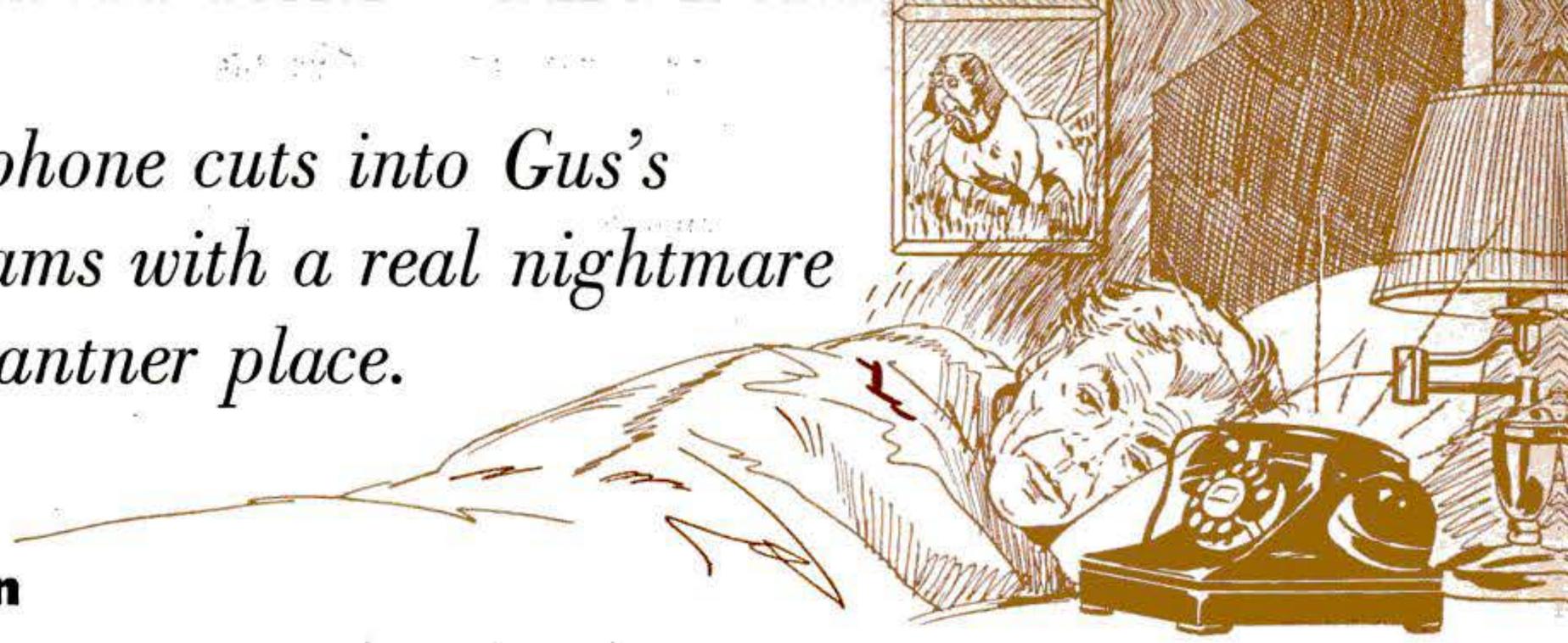
Gus Saves the Old Homestead

The long trailer leaned drunkenly under its cargo of poles, directly above the small house in the ravine.

A jangling phone cuts into Gus's peaceful dreams with a real nightmare out at the Gantner place.



By Martin Bunn

MORNING was still a smoky gray, pierced only by the ticking of a clock and the sounds of heavy sleep. Sunday, at that hour, was never disturbed by the rattle of milk bottles, or the usual shriek of hot shave water through old plumbing. Maybe that was what made the sudden jangle of the telephone so grating.

Gus Wilson groaned and tried to shut out the sound. But it chased him around the edge of his pillow. Blindly he reached for the receiver.

"Gus? This is Billy Ryan. I hate to bust up your dreams, but we need your help."

"Help! Listen, Billy. This is no time to be playing cops and robbers. Why don't you climb into your patrol car and drive out to East Mountain? They say the sunrise there is real pretty."

"That's where I am now. There's a truck stalled here on the grade with a conked-out engine and a load of telephone poles. The way those logs are shifting it won't be long before the cables snap. When they do there's a little house right below the road—the old Gantner place, you know—that's going to look like Home 1 after the Yucca Flats atomic-bomb test."

By now Gus was coming to.

"You pick me up in front here," he said.

Billy's Patrol Car Skids to a Stop

Gus put his hand on the door handle as Billy Ryan's patrol car squealed to a stop.

"Okay, Billy," he said. "You can fill me in on the way."

"There isn't much to tell," Ryan began as they sped away. "The truck driver called the station from this house that's practically under the load. Said he was hauling the poles for a replacement job when the engine died halfway up the hill. It was too dark to back down, and he didn't want to trust his brakes to hold him. So he backed onto the shoulder, figuring to pull out as soon as he located the trouble."

"Only the engine wouldn't start," Gus interrupted, "and the outward slant of the road kept pulling on the load until the cargo started slipping."

"You're right about the poles," Ryan said, "but not about the engine. She'll start easy enough, but she peters out every time she's forced beyond an idle. I've got the Gantners up on the road where they're safe enough. But that place of theirs is going to be leveled if those poles let go. Be a shame, too; old Julius Gantner built it himself, back in the '60s—the first house up in that neck of the woods—and it's been home, now, to four generations of Gantners."

Gus scratched his head.

"How about my tow truck?"

"No good. Only a cat could wrestle that dead weight up the grade."

"Can we shore up the poles?"

"Not a chance. The slope above the road is bare; nothing to wind a cable around."

"What happens if I get the engine fixed?"

"Then he's going to take off up the hill as fast as he can. If he can push his luck as much as 50 yards, the house will be safe."

The Trailer Leans Drunkenly

The sun was just tipping the pines when the road broke through a slash in East Mountain, and they saw the truck, high on the shoulder of the bald ridge beyond. Its long flat-bed trailer leaned drunkenly under the cargo of poles, directly above a splash of earth that fell off sharply toward a small house plastered against the side of the ravine. Four small figures standing at the side of the road added a final touch to the cheerless scene. Three of them would be the Gantners—Tom Gantner, old Julius' grandson; his wife, Mary, and their teen-age daughter, Susan—the other, the driver of the truck.

Billy Ryan eased to a stop a hundred feet behind the trailer.

"It's your move, Gus," he said.

Gus trotted ahead, nodded to the stocky driver who came forward to meet him, and

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noted with approval that the hood was already up, the engine running, and the tools laid out on the fender.

"Sure glad to see you, Mr. Wilson," the driver said. "I'm Bill Berry. Guess you know the rest of the story."

"Ryan's been briefing me," Gus said. "Engine idles okay, but dies out when you pour on the power. Anything else?"

"Not much. There was a little sputtering the last few weeks, so I had the fuel line blown out yesterday, and a new fuel pump put in. She ran fine after that."

He was interrupted by a faint but ominous creaking.

"Hear that? Those poles are still shifting. Cables can't take that strain forever."

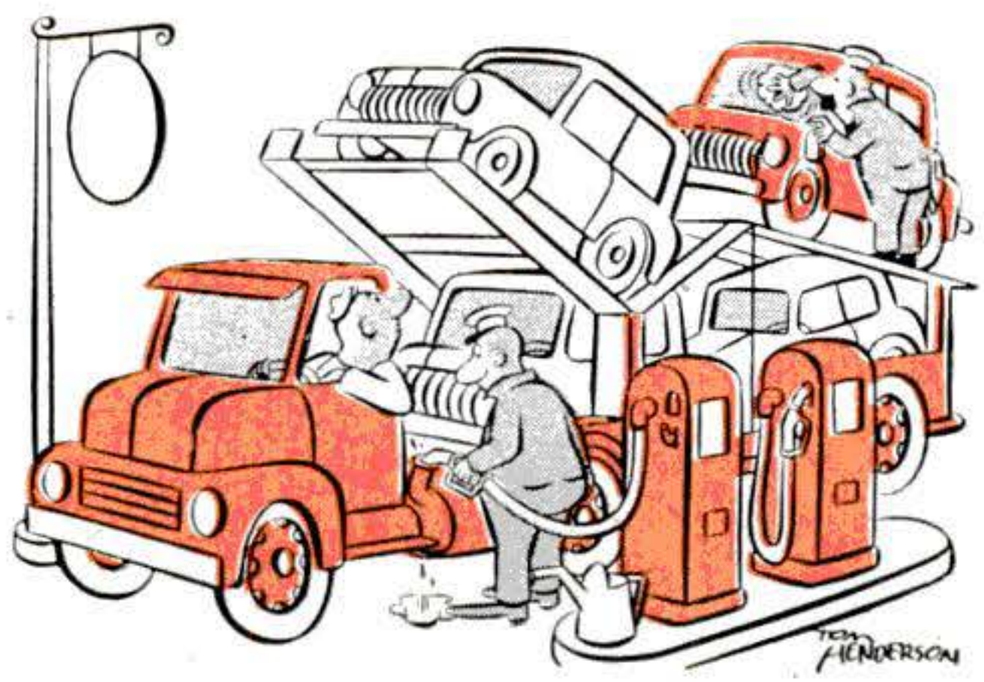
Tom Gantner had moved up quietly on the other side. His face was tense.

"I've heard you are a good mechanic . . ." His voice trailed off.

Gus turned from a quick inspection of the ignition system and smiled.

"I'll do my best, Mr. Gantner."

Plenty of juice danced against his screwdriver at the plugs. The points in the distributor were good and there was no sign of a short. There seemed to be plenty of output in the coil and the condenser looked okay.



With ignition crossed off the list, it was plain the engine was starved for gas. Gus began twisting the regulator screw on the carburetor. When he was sure that any richer mixture would drown out the plugs he pulled the accelerator arm. The motor coughed and died.

At a word from Gus, Berry climbed gingerly into the cab and stepped on the starter. The engine ran for a minute or two at idle, then died again. Gus puzzled a moment, then leaned the mixture down to its original strength. Berry started the engine again. This time it didn't die—not until Berry tried to increase its speed.

Looking for leaks, Gus traced the fuel line from the carburetor to the tank, wiping away grease and dirt, prodding, probing, but finding nothing.

He had been listening for a thin hiss at the intake manifold. The fact that he couldn't hear it didn't mean anything; a bad leak might lower the pitch and make it harder to detect among the other noises.

"Have you some light oil handy?"

Berry dug a can of household oil out of the running-board toolbox and Gus dropped a little around the manifold gasket. None of it was sucked in at the seal.

"That's out," Gus scowled. "I thought maybe your manifold facing might be warped from overheating, or that the gasket was shot."

Whatever it is, he told himself, it's right under my nose. Some small, simple . . . Wait a minute!

Gus was looking at the filter unit, the small glass cup with the ceramic filter. "Shut her off," he called to Berry.

Disconnecting the cup he mopped it out with a chunk of waste, wiped off the filter and put the unit back in place. There had been at least a spoonful of red silt at the bottom of the bowl.

"Now start her up again and gun her."

Berry cranked the engine back to life and hit the gas. This time the engine roared for a moment before conking out.

Gus took the cup off again and studied the intake and outlet tubes. They looked all right. He put the cup back, minus the filter. That would let him watch the flow of gas into the unit.

When Berry bore down on the starter the fuel jetted in with healthy bursts that quickly climbed to the level of the outlet tube. An instant later the engine caught. Gus shouted to Berry: "Gun her!"

The engine burst into a full-throated roar and stayed there, bellowing sweetly.

The Ponderous Cargo Teeters

Berry didn't wait to ask questions. He put the truck in gear and inched ahead letting the engine take the strain gradually. Five feet. Ten feet. The ponderous cargo of poles teetered perceptibly. But somehow the cables held.

Tom Gantner grabbed his wife and daughter and shouted with relief.

"He's made it! By jingles, that boy has made it. Sounds silly to say it, maybe, but Gus Wilson's saved the old homestead!"

[*Continued on page 250*]

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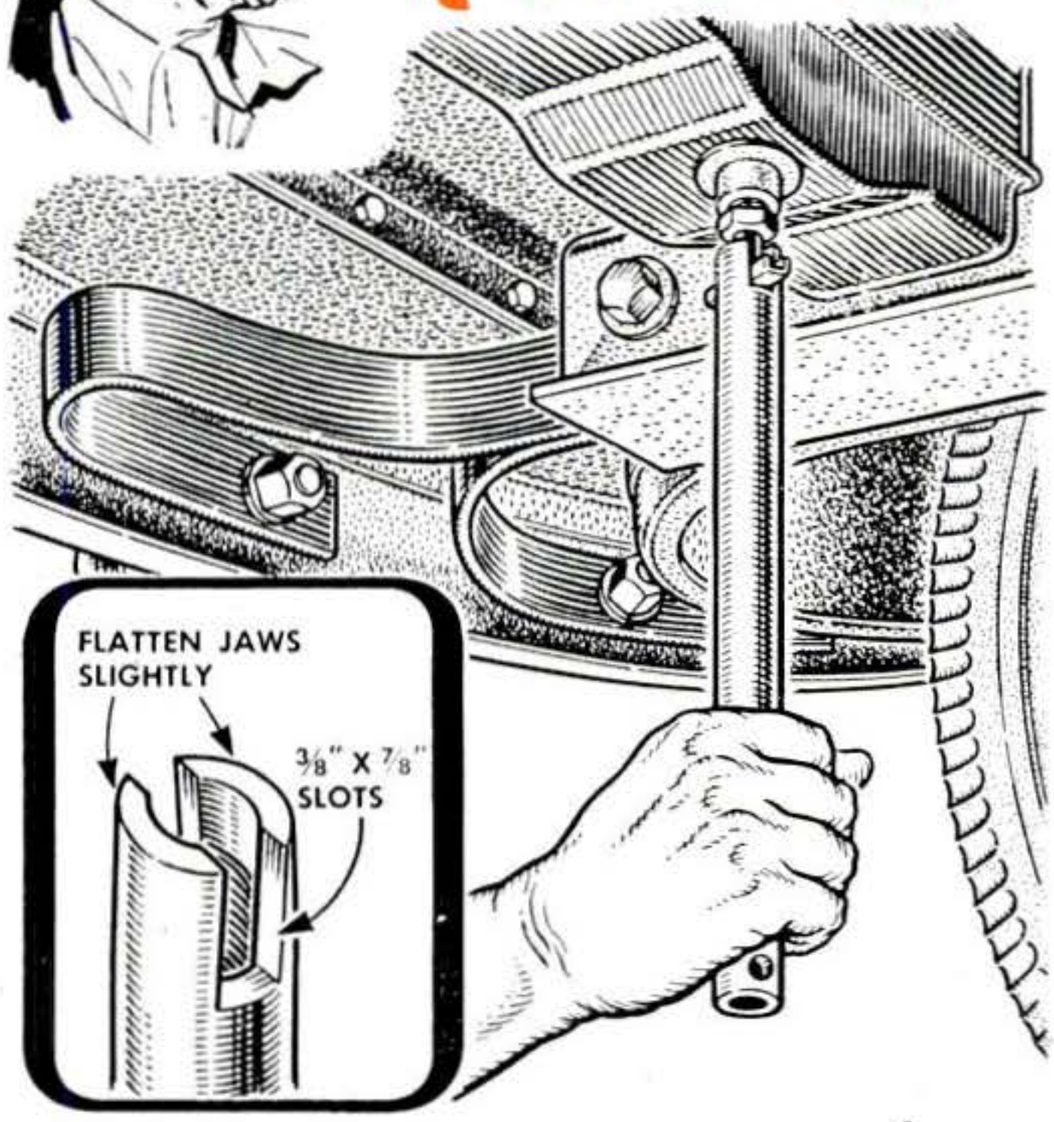
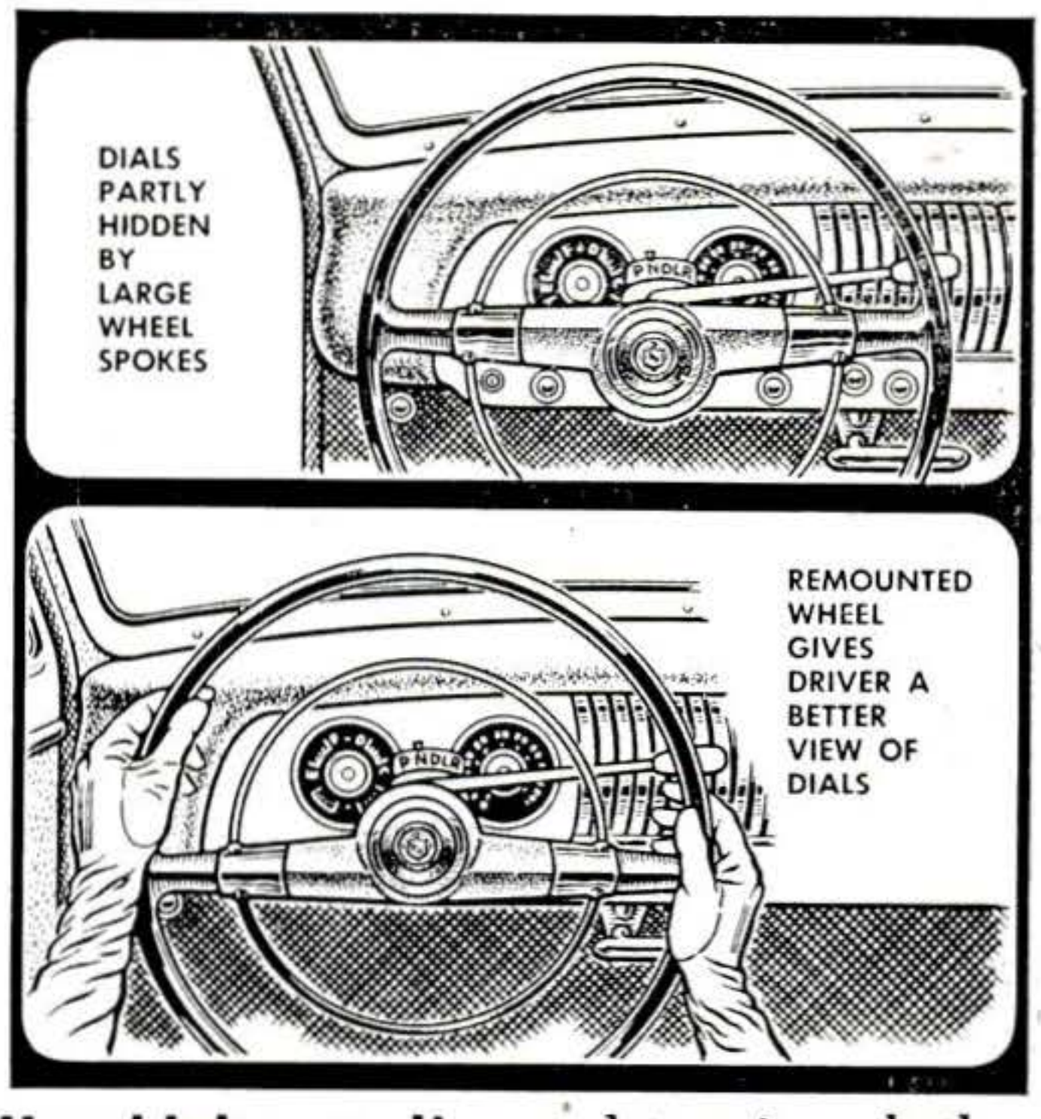
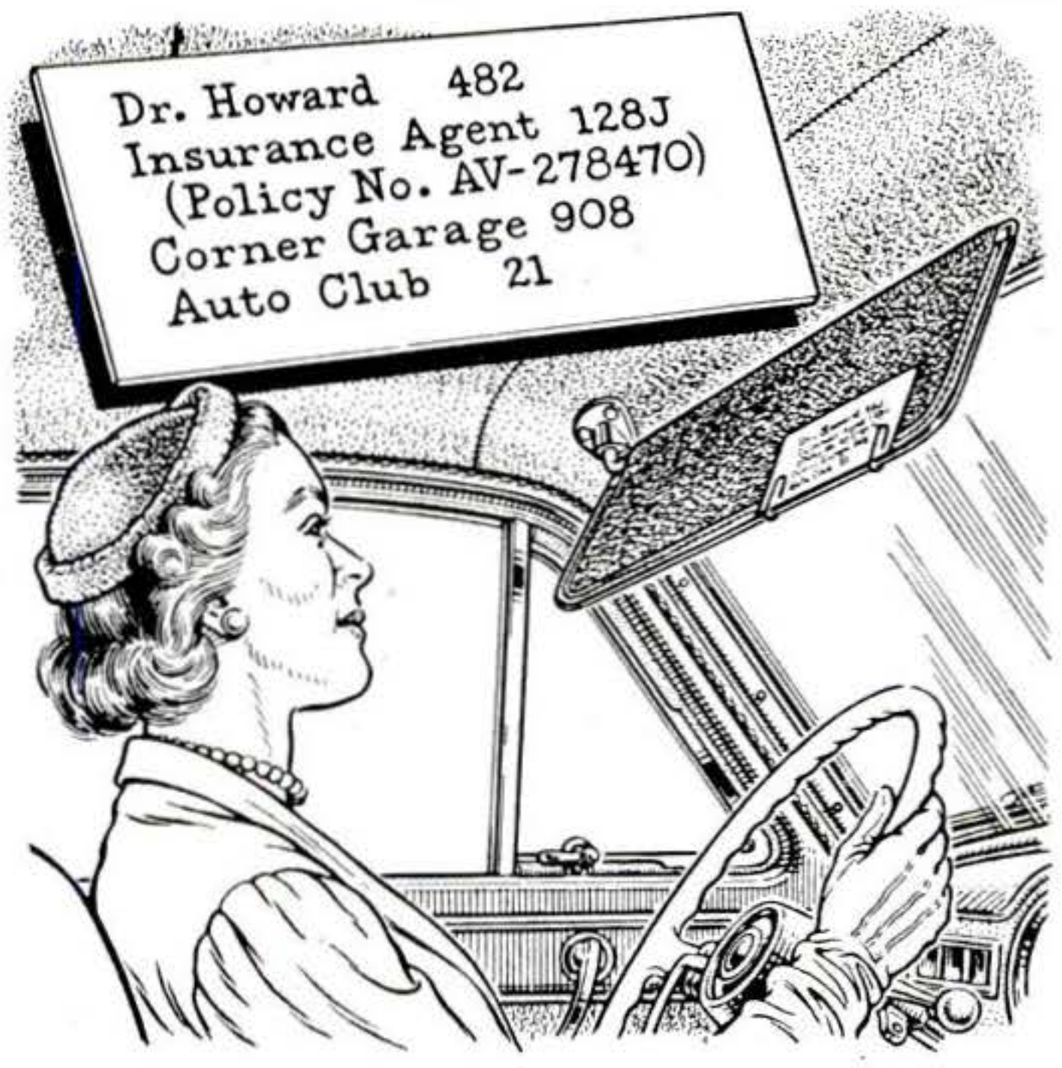
Hints FROM THE MODEL GARAGE



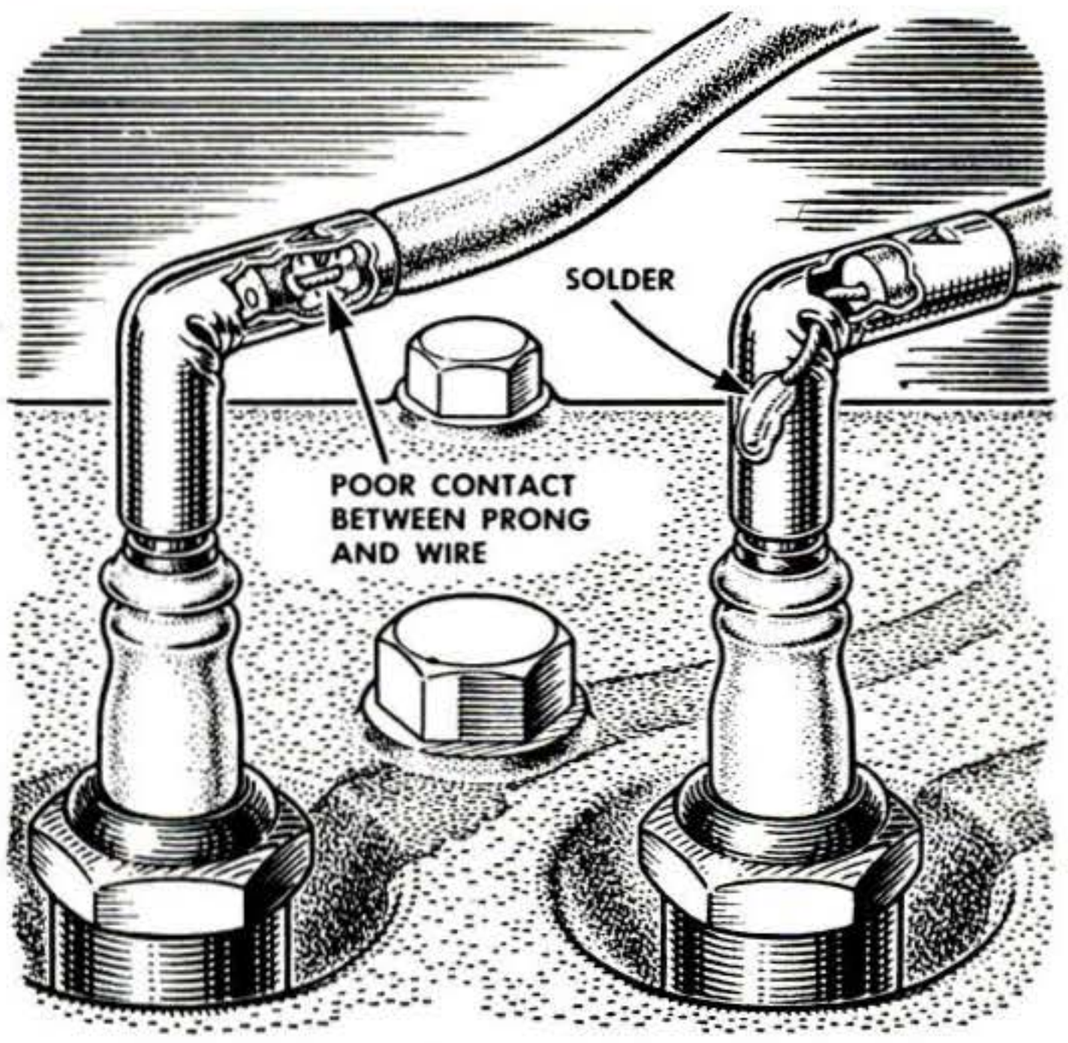
A wrench made from hardened copper tubing makes it easier to open and close a cooling-system petcock under the car. As you open the petcock, the coolant will run down the tubing, not your sleeve. Drill a hole in the end and hang it on a nail.



How high you sit may determine whether you have a clear view of the driving gauges through the steering wheel. On late cars with two-spoke wheels it sometimes helps to pull off the wheel, turn it 180° and remount it with the spokes below the center.



For emergencies, especially if several of the family drive, post a list of essential telephone numbers in the car. Include the policy number of your car insurance as well as the numbers of any personal-accident or hospital coverage that you have.



Hard starting may result from a faulty contact between the spark-plug wire and connector. In such cases, one mechanic suggests stripping back the insulation, replacing the connector and soldering the bare wire to the side of the connector.

Please turn the page for more auto hints.

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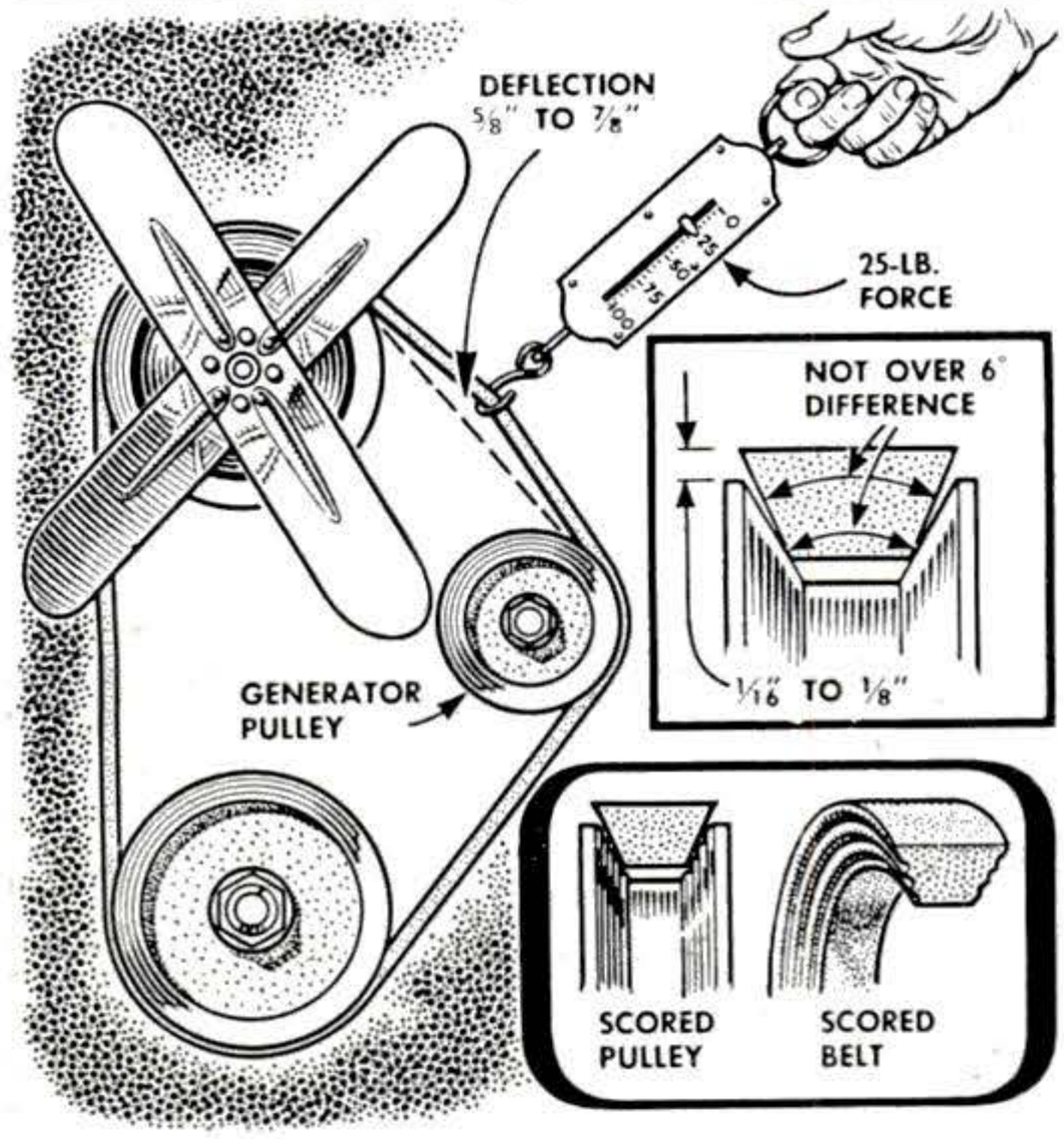
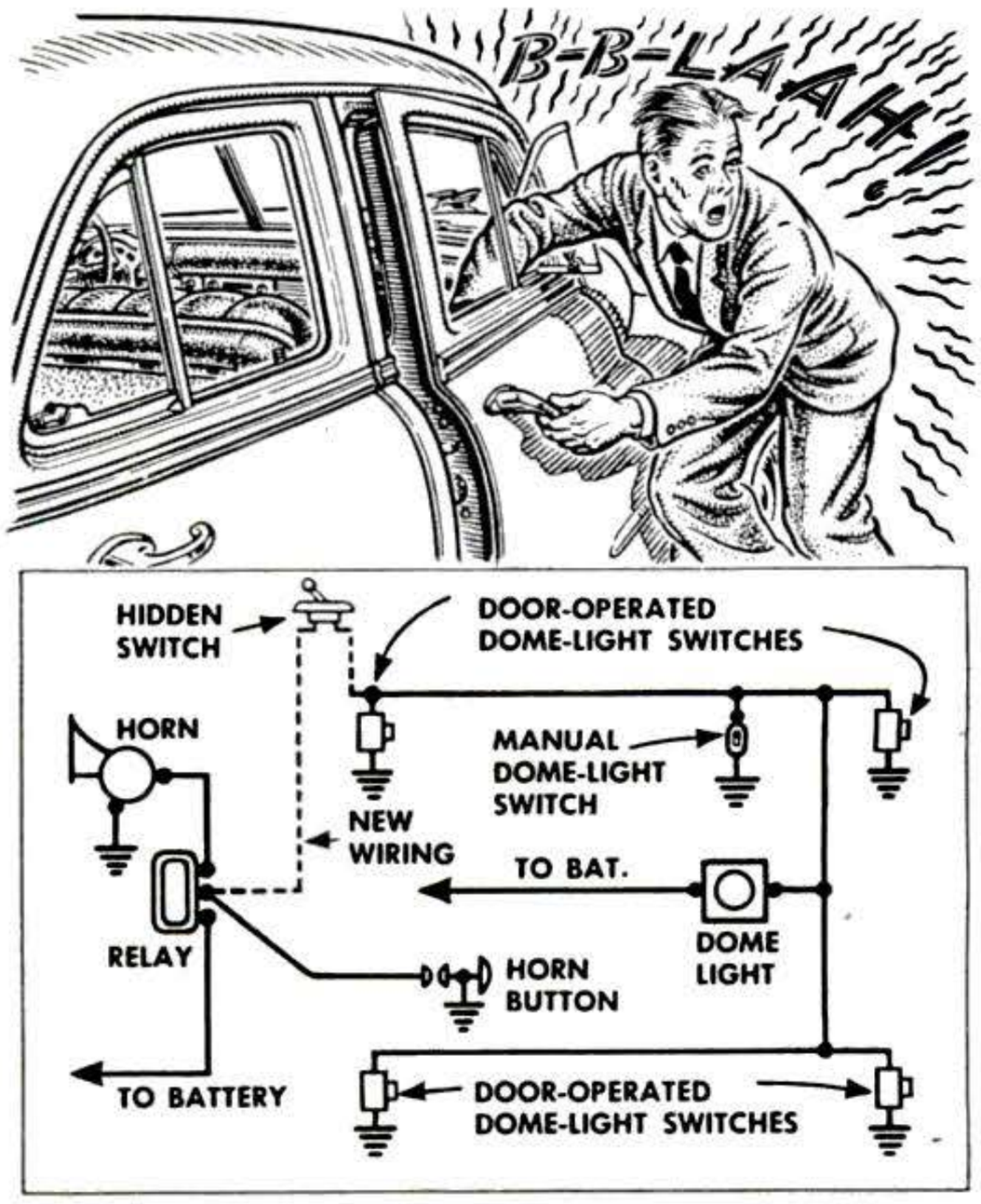
MORE Hints from the Model Garage

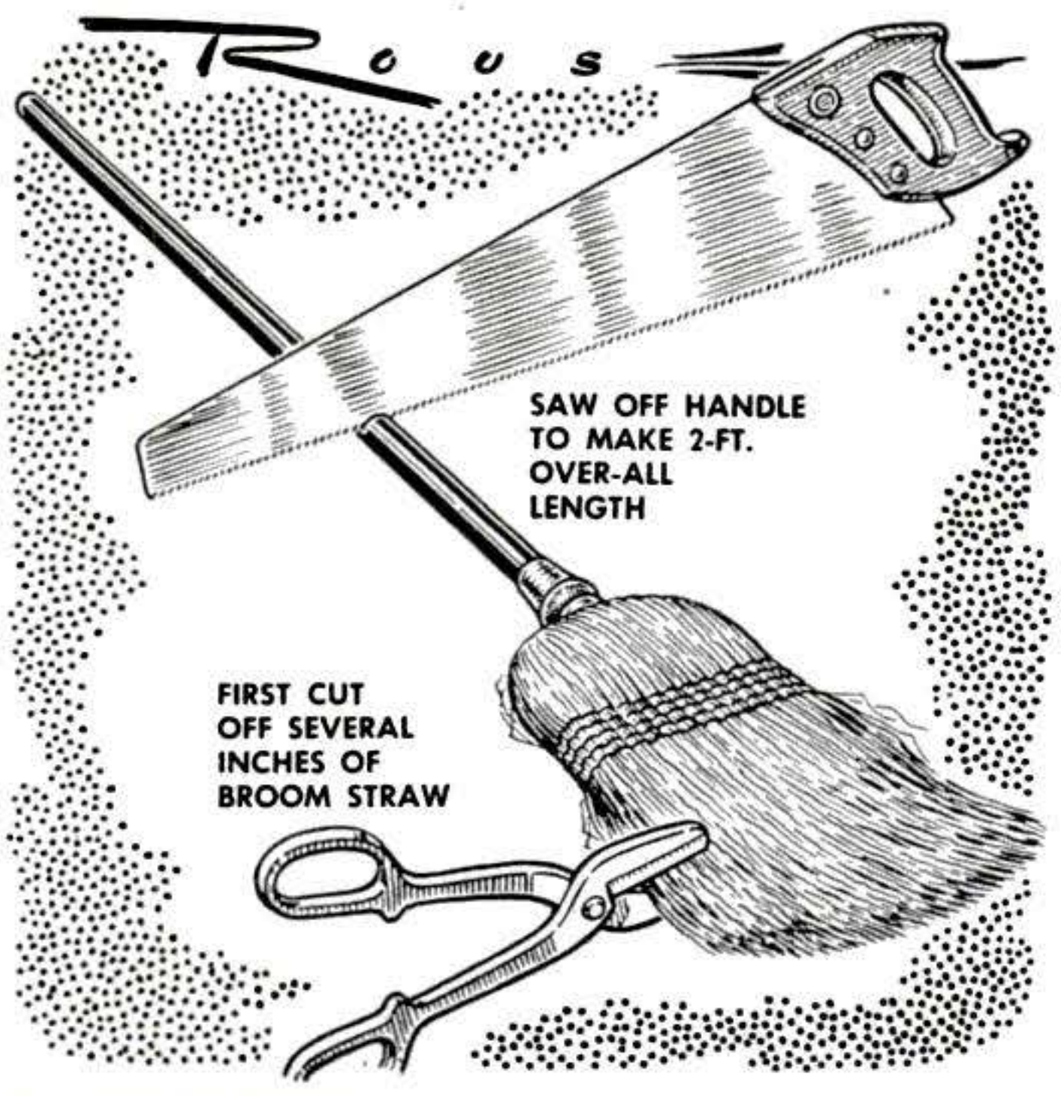


Fan-belt life may be shortened by any of the reasons indicated here. In installing a new belt, always make sure it is engineered (in cross section) to fit your particular pulleys. If a pulley is scored, your belt eventually will become scored too—and weakened. If too tight, the belt will damage water-pump and fan bearings.



A simple and effective burglar alarm can be installed with a length of wire and a single-pole switch. Use the wire to connect the horn and courtesy-light circuits through the switch. If anyone opens the door, the horn will blow. Hide the switch somewhere on the exterior of the car so you can shut off the alarm system.

If static sparks crackle from your fingers when you slide into or out of a car equipped with plastic seat covers, try keeping your hand on the door handle until you are settled or out. This will carry off the charge from your body.



A handy brush for cleaning road dirt from the underside of a car can be made from a discarded household broom. Shorten the handle with a saw and snip about 6" off the bristles, leaving just enough so you'll have a brush that's good and stiff.

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What You Should Know
About Spark Plugs

Too many drivers pay too little attention to the need for using the right plugs right, this expert declares.

By Howard Vogel

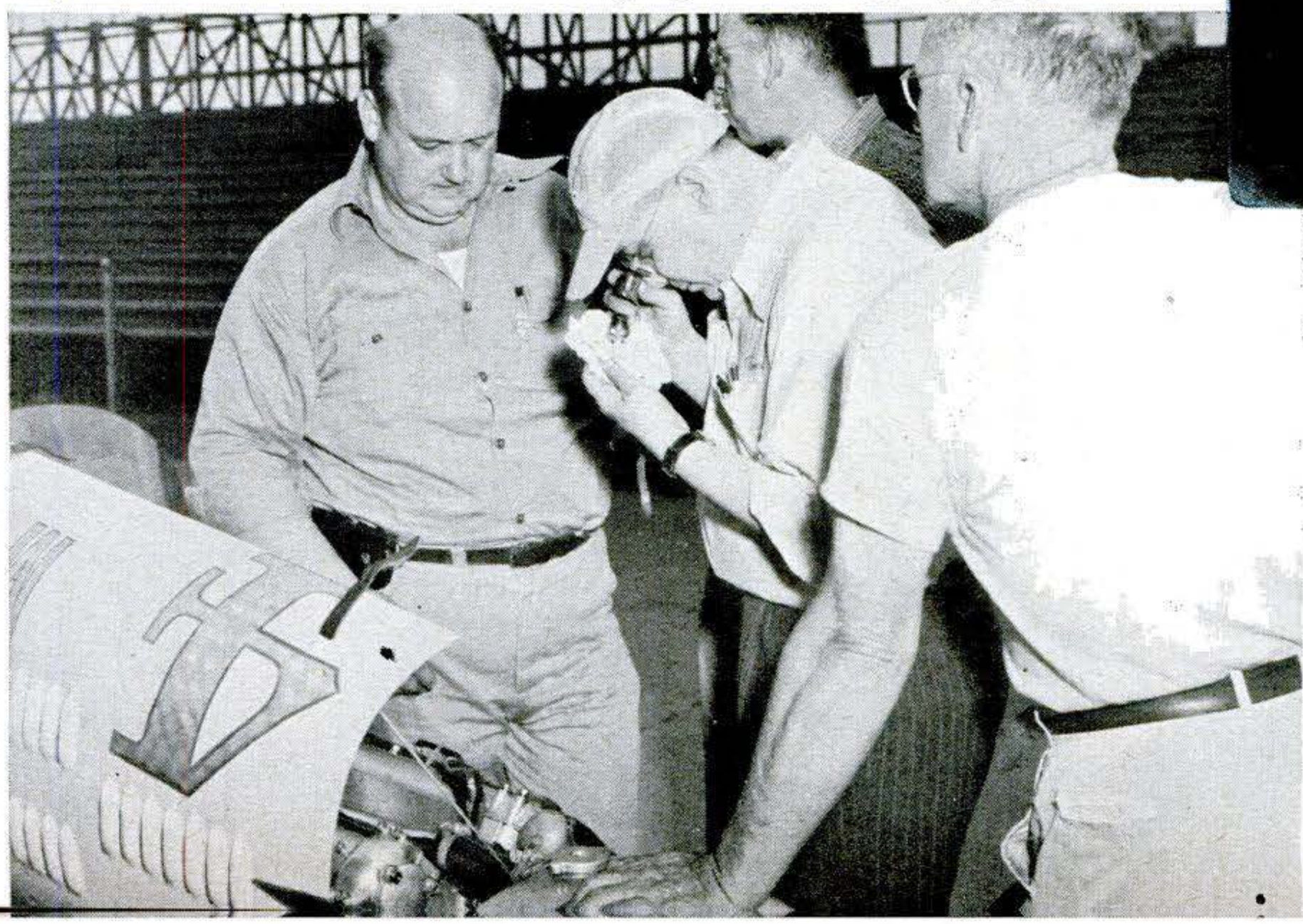
WITH compression and horsepower definitely on the way up, it's time all car owners learned the facts of life about spark plugs. And this goes not only for the average motorist, but for professional racers and sports-car enthusiasts as well.

Spark plugs aren't complex. But pick the wrong type for a high-speed engine, do a sloppy installation job and you may run up a whole string of complexities—including lost compression, horsepower and speed.

I have seen this happen surprisingly often while working with high-compression engines. A Champion crew began servicing racing engines at the Indianapolis Speedway back in the Twenties. Even then, compression ratios of better than 7-to-1 were commonplace. In the intervening years, our crew has serviced racing engines at most of the nation's top tracks and famous water raceways. We have seen a lot and learned more.

Use plugs of correct reach. First of all, if you want to get the most out of your engine, be sure to select the proper type of plug for your engine and your driving habits—not just one that happens to fit the hole. European cars, for example, use at least

THE AUTHOR, Howard Vogel, is one of America's top authorities on spark plugs. A graduate of Purdue in 1932, he went to work the same year as a draftsman for Champion, became chief engineer of that company in 1946 and director of engineering a year later. Several times each year he gets away from his desk to head up a crew that provides plug service at such races as Indianapolis and Daytona Beach. Below he checks a plug with a magnifying glass.



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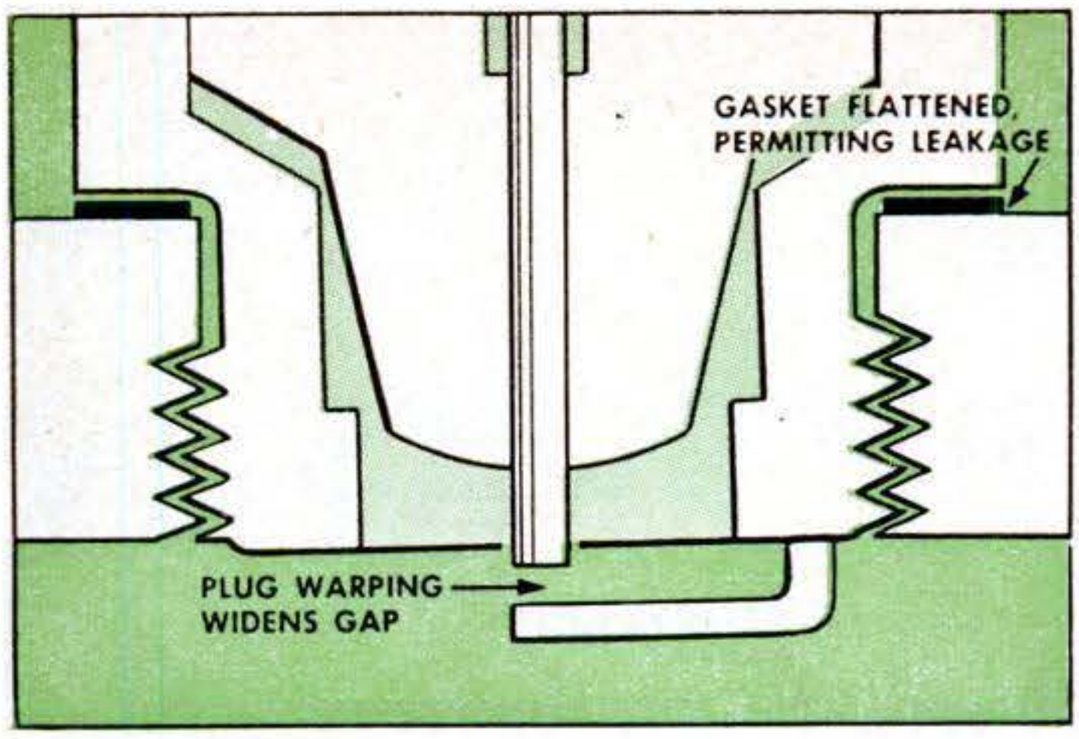


TOO MUCH TORQUE is as bad as too little in seating a spark plug. If the gasket is flattened so much that gases leak from the combustion chamber, you lose compression and overheat the plug, shortening its life. A heavy hand with the wrench also may warp the bottom shell, pulling the electrodes apart.

three different reaches (lengths of threaded sections) of plugs in the 14-mm. size. They are ⅜", ½" and ¾".

We have found that you can't put the longer-reach plugs in an engine designed for a ⅜" reach and expect efficiency. Neither should you put ⅜"-reach plugs into holes designed for longer ones. The same thing is true, incidentally, in most American passenger cars where we have both ⅜"- and 7/16"-reach plugs in the 14-mm. size.

Here's what can happen. The main trouble with installing a long-reach plug in a short-reach hole is that the bottom threads extend into the combustion chamber and can become coated with fuel deposits. Not only will the end of the plug overheat and cause a probable power loss but the threads in the cylinder head are very likely to be damaged when the plug is removed.

Conversely, when a short-reach plug is placed in a long-reach hole, it's the exposed cylinder-head threads that become fouled with carbon-like deposits. Later, when you install the proper-type plug, the end will hit those clogged threads and prevent proper seating of the plug on the gasket.

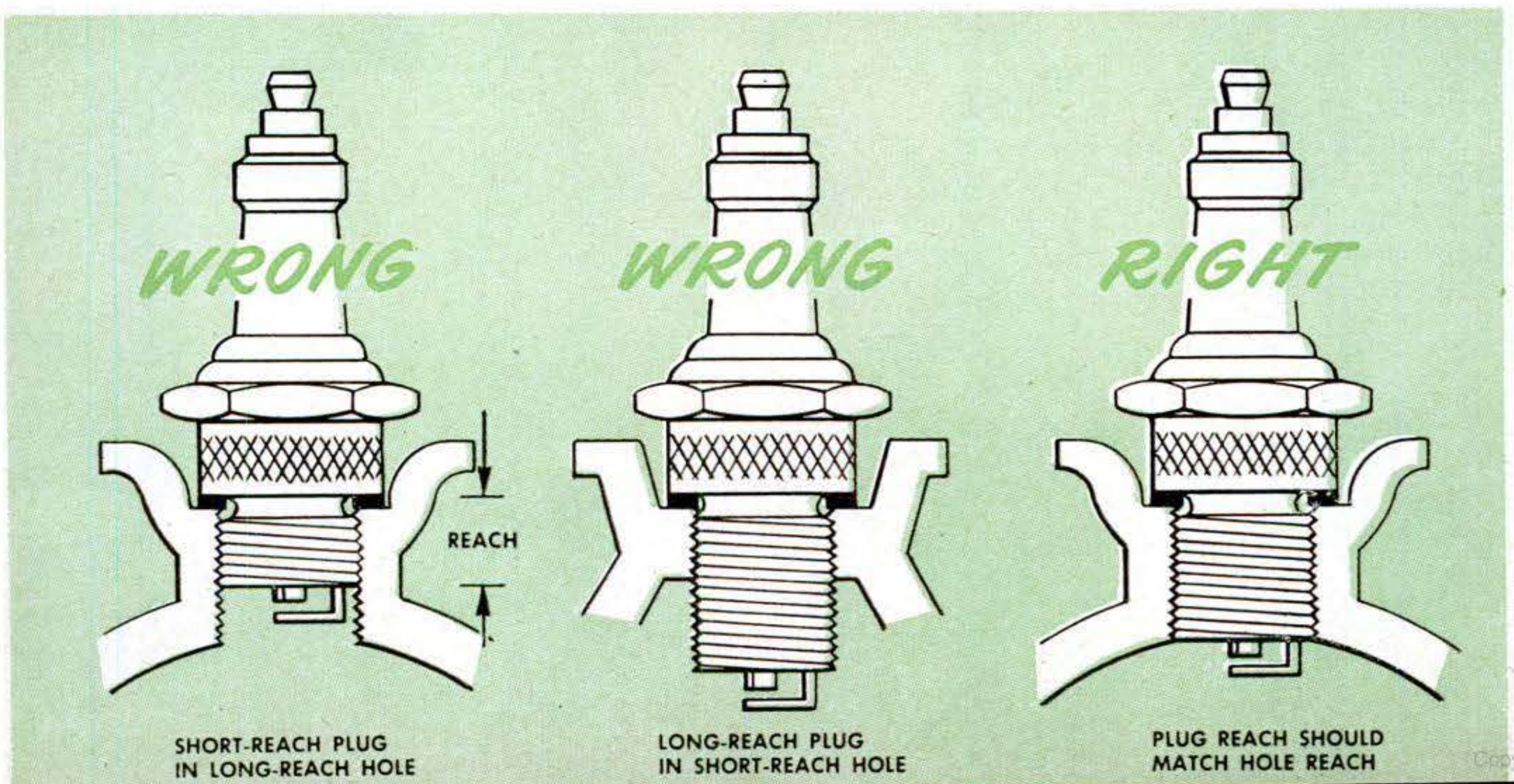
This situation of the too-short reach can pile up a number of troubles. The higher position of the firing end will tend to delay combustion, giving the same effect as a slightly retarded spark; the unfilled cylinder hole will increase the combustion-chamber area and may affect compression; and the plug undoubtedly will overheat.

Heat range. This is the next consideration in proper plug selection. Over the years spark plugs have been designed, laboratory- and road-tested in all types of equipment to check and rate their ability to dissipate heat from the firing end.

Selecting a plug in the right heat range depends largely on driving conditions. The car maker has tried, in the sports-car as well as the regular-car field, to specify a plug for all-around service. But in many cases the ordinary car driver will never drive at highest speeds; most of his driving will be in slower stop-and-go city traffic.

In city traffic, then, the plugs may run too cold and accumulate deposits which in time will short the firing end of the insulator and cause the engine to misfire. In this instance, it is our policy to install a plug one step hotter. On the other hand, if a plug operates too hot in an engine, the life of the electrodes will be shortened. And under some high-speed driving conditions, the plug may build up such heat in the combustion chamber that it will cause preignition and detonation.

Fuel can affect heat range. We know; we've had the headaches. More than once our crew has serviced a racing job, adjusting the gaps with Swiss-watch precision and installing the plugs in accordance with



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the best practices. We've watched the car in a practice run, the cadence of the exhaust sheer perfection.

The next day things go wrong. The multi-thousand-dollar special sputters back into the pits with the plugs badly fouled. Once we were puzzled. Now we get the solution by asking "what've you got in the tank?" Racing engines are critical and switching from gasoline to cooler-running alcohol—or back—definitely can affect spark-plug heat range.

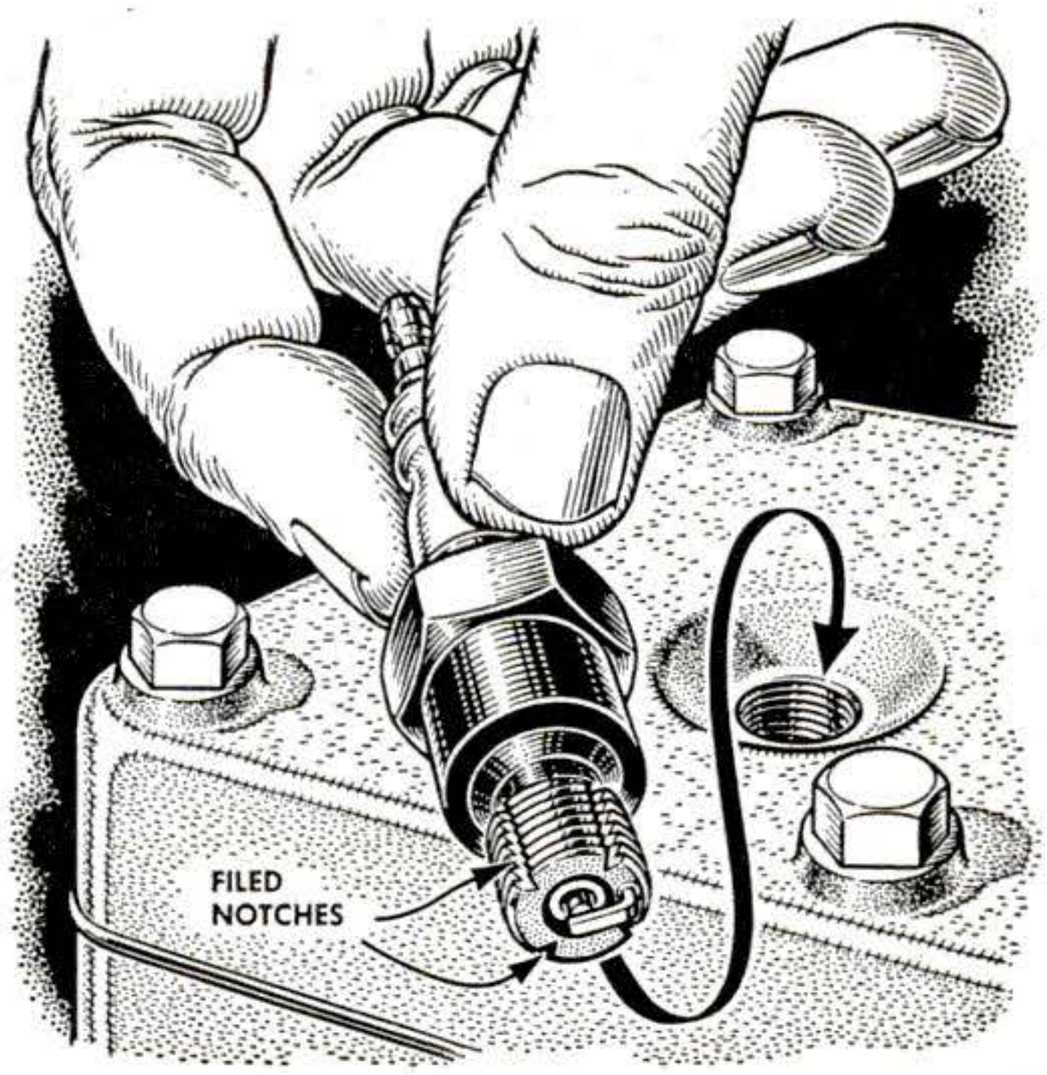
Proper installation. You'll note that in many garages a torque wrench is used to tighten down the head properly so that the head gasket doesn't burn out. This same problem arises in spark plugs as we are trying to dissipate heat from the spark plug through the little copper gasket.

Improperly installed plugs may indicate, when removed, that they are operating at too high a temperature—electrodes may be burned and the insulators very white in color. This appearance might seem to indicate need for a different type of plug. But just looking at the firing end doesn't always determine whether such a change should be made. First, examine the outside copper gasket to check proper installation. After that, if installation is satisfactory, is the time to determine whether the correct plug is being used.

Insufficient torque will fail to compress the copper gasket properly for a good seal. The resulting leak will cause some loss in compression and make the plug overheat. Too much torque may stretch the gap right out of adjustment or in the racing-type plugs may so warp the shell that the internal structure of the plug will be damaged.

Even the pros go wrong. We keep stressing correct installation because too few persons understand its importance from the standpoints of both efficiency and economy. And we're not referring merely to the average motorist, either. At the NASCAR meet in Daytona Beach last spring, we were amazed to find plugs that could be unscrewed with our fingers from engines sporting expensive special heads, cams, manifold and exhaust systems.

Furthermore, we found ignition cables cracked and deteriorated on some of these costly jobs. These conditions, of course, affect spark plugs because they're at the end of the line. As a result we organized an "ignition clinic" for several hundred drivers and mechanics and were gratified the next day to see them out on the line with wrenches and gauges checking their plugs.



YOU CAN MAKE A CLEAN-OUT TAP from an old plug by filing four square-edged notches across the threads. Turn the tap into the cylinder head without a gasket and it will clear out any carbon left on the bottom threads if old plug was short or loose.

Real evidence that spark plugs, properly selected and installed, can contribute to surprising engine performance was supplied by Bob Pronger, a Chicago driver in the Daytona strictly-stock race.

Bob reported that he had tuned his '53 Olds on a dynamometer in Chicago, testing various types of plugs. The right combination (Champion J-6's) was an eye-opener, he said. The engine revved up 300 r.p.m. faster.

It paid off. Bob set a new record in the prerace time trials—113.28 miles an hour for a two-way run over a measured mile. END

Next month: Read how to use a spark-plug tester for ignition trouble shooting on cars, oil burners, mowers and outboards.

Plug Facts in a Nutshell

Select plugs with a reach to match the cylinder-head threads and a heat range to suit your driving conditions.

Gap them as recommended.

Turn a clean-out tap into the cylinder-head threads and clean the cylinder-head gasket seat.

Fit a new gasket to each plug.

Seat to the proper tightness.

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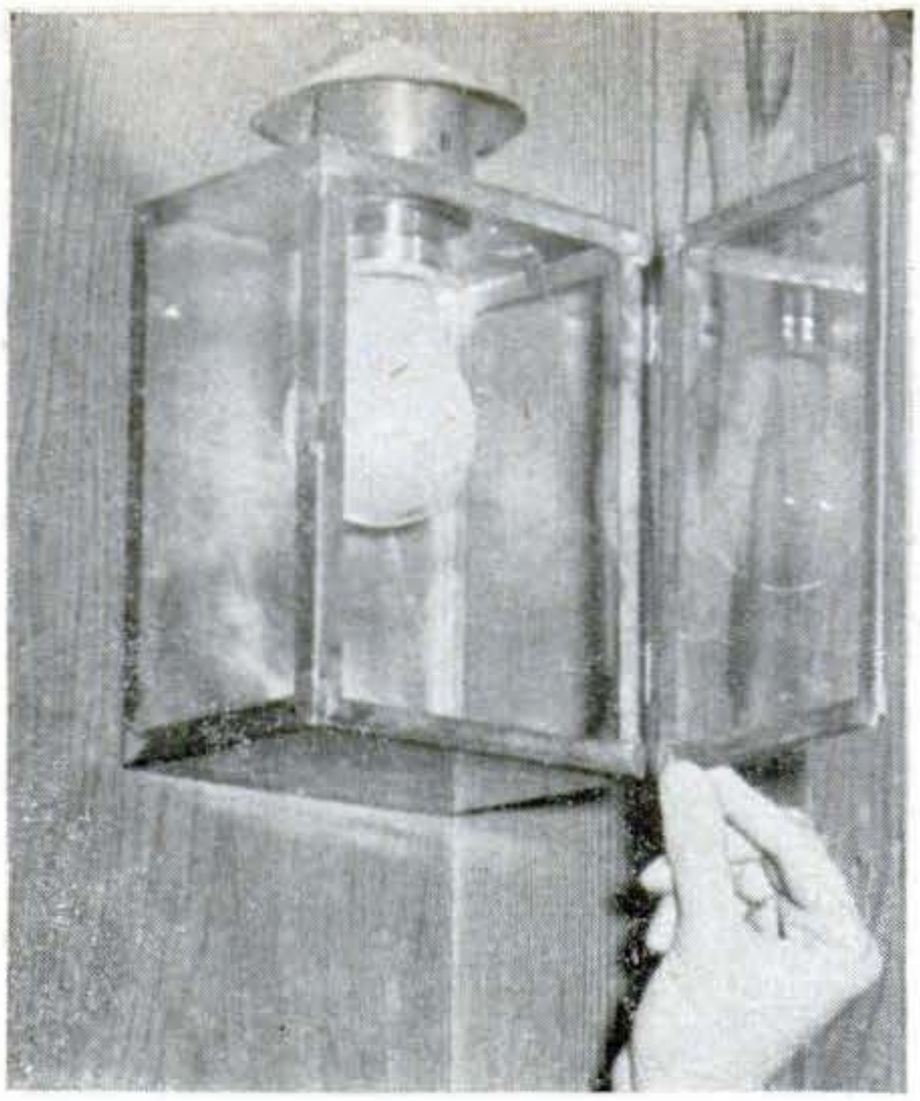
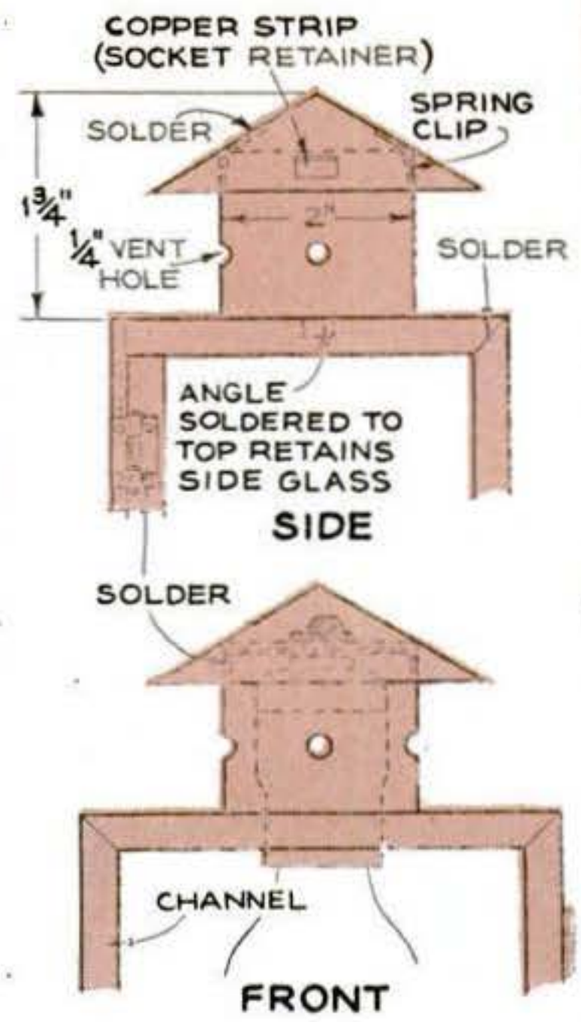
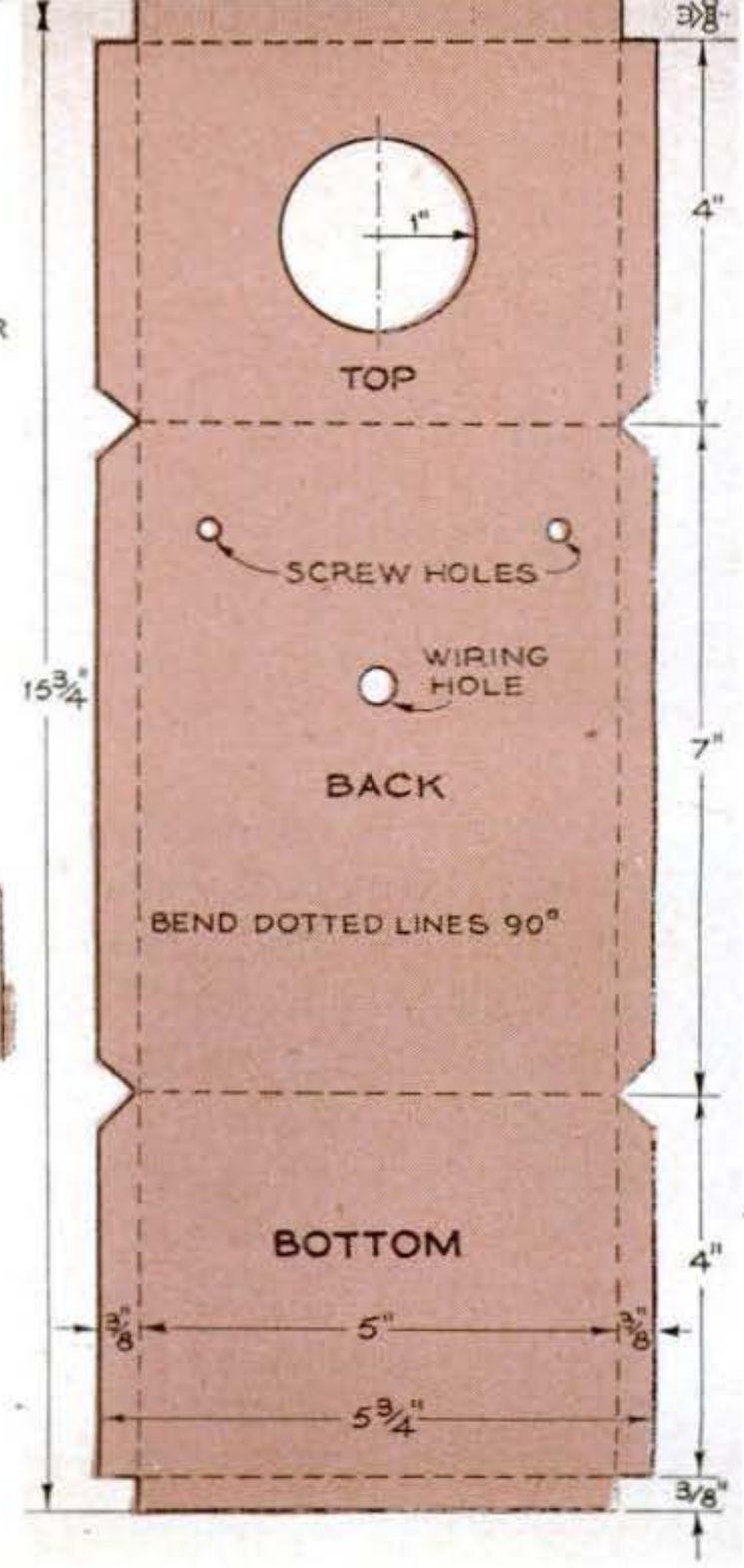






Spot This Lamp on Your Garage

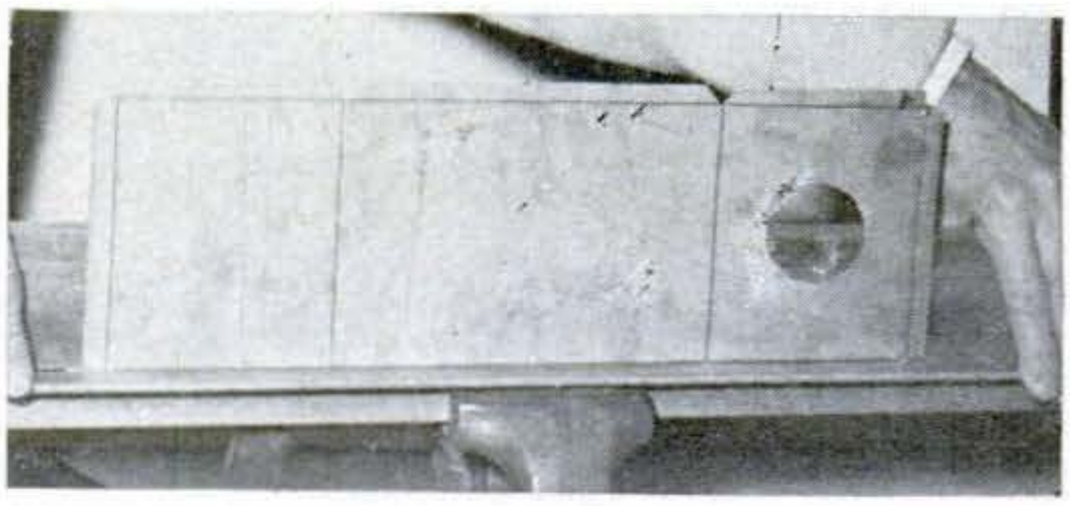
You make it by cutting and bending sheet copper and soldering the parts together to look like a lantern.

MOST homes could use more light at the garage door, and that's a spot where this copper lantern will look especially good. Center one of them above the door or make a pair and put one on either side. You can also use two of them in the traditional location, the front door, or mount one on a post as a yard light.

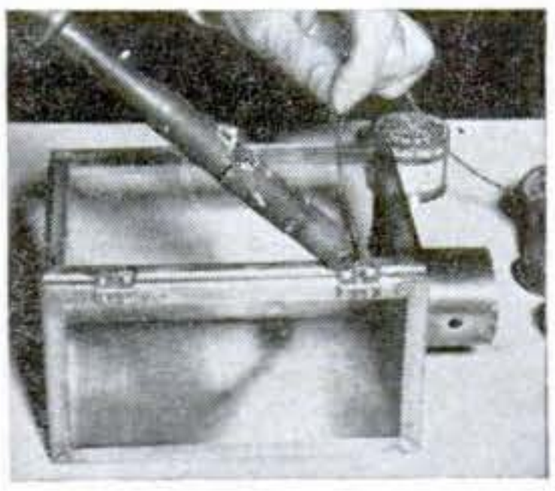
Body. The top, bottom and back are a single piece of light-gauge sheet copper cut and bent according to the pattern. The front corner posts are ¾" strips of the same material bent 90° and then soldered in position. After the windowpane glass sides are put in place, small copper angles are soldered inside the top and bottom of the lamp to keep them there.

Top. A strip of copper 1¾" wide rolled to a diameter of 2" forms the lamp house at the top. Solder the ends of this together and then solder one end of the roll around the hole in the top of the lamp. A ⅝" strip with a hole in the middle soldered across the lamp house provides a bracket for mounting the lamp socket. Copper spring clips soldered to the conical top keep it on the lamp house.

The door frame is made by bending copper strips about ⅞" wide into channel shape to fit the pane of glass. Cut the strips at a 45° angle on each end. Solder the bottom and two sidepieces together while they are squared up with a framing square. Then slip the glass in and solder the top strip in place. Be careful not to apply too much heat suddenly when using the soldering iron near the glass or it may crack.—*John Rogers, Dallas.*



RIGHT-ANGLE BENDS in sheet copper can be made by clamping the metal between two pieces of angle iron in a vise. Then put board behind copper, bend with one motion.



SOLDER HINGES to the corner post first. Then put the door into place and solder the hinges to it. A spring clip soldered to the other corner post will keep the door closed.

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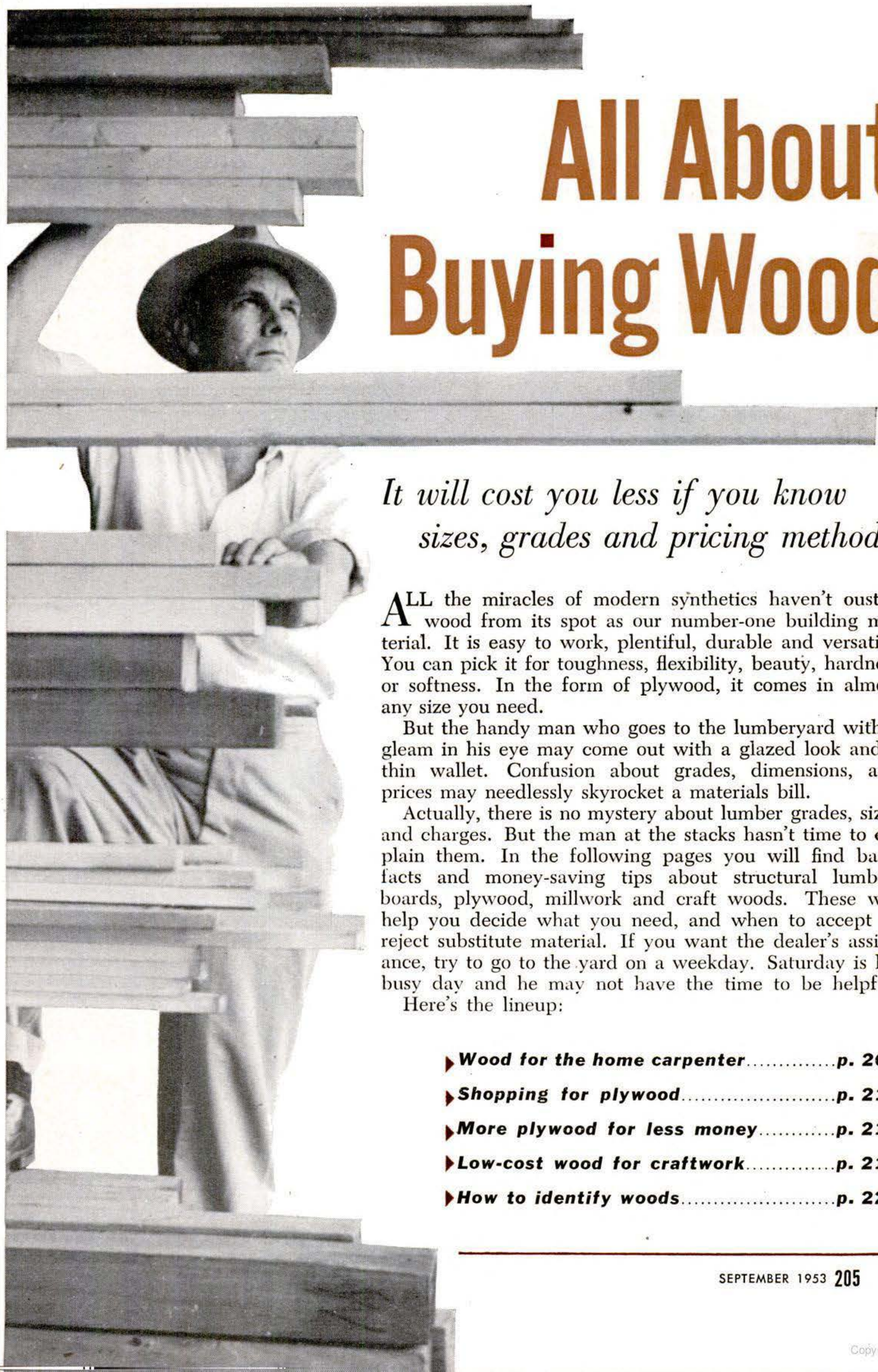

All About Buying Wood

It will cost you less if you know sizes, grades and pricing methods.

ALL the miracles of modern synthetics haven't ousted wood from its spot as our number-one building material. It is easy to work, plentiful, durable and versatile. You can pick it for toughness, flexibility, beauty, hardness or softness. In the form of plywood, it comes in almost any size you need.

But the handy man who goes to the lumberyard with a gleam in his eye may come out with a glazed look and a thin wallet. Confusion about grades, dimensions, and prices may needlessly skyrocket a materials bill.

Actually, there is no mystery about lumber grades, sizes and charges. But the man at the stacks hasn't time to explain them. In the following pages you will find basic facts and money-saving tips about structural lumber, boards, plywood, millwork and craft woods. These will help you decide what you need, and when to accept or reject substitute material. If you want the dealer's assistance, try to go to the yard on a weekday. Saturday is his busy day and he may not have the time to be helpful.

Here's the lineup:

- **Wood for the home carpenter** ..... **p. 206**
- **Shopping for plywood** ..... **p. 213**
- **More plywood for less money** ..... **p. 216**
- **Low-cost wood for craftwork** ..... **p. 218**
- **How to identify woods** ..... **p. 220**

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WOOD... ***Hard or soft, green or seasoned, rough or surfaced? Choosing it and using it wisely will save you time and money.***

Wood for the Home Carpenter

By Edwin M. Love

THERE are three ways to buy wood for that project you're planning. All cost money, but a couple can be downright extravagant. One is to tell the yard man you want "some three-quarter-inch stuff about so big and that long" and hope for the best.

Another is to tell him what's building and let him try to outguess you as to construction, finish, and how much dough the job is worth to you. He may play safe and sell you top-grade stuff, charging you accordingly.

The third is to know how lumber is sold and figure out what you want before stepping out of the house. This can save you time at the yard, keep the dealer your friend and earn you a cash saving. To buy like this, you need only know some basic facts about the trade.

Hardwood or softwood? Whether the wood is easy or hard to dent or drive a nail into is not what decides its type. Some hardwoods are fairly soft, and vice versa. Hardness will vary, too, with the part of the tree the piece came from, and its moisture content. There is no sharp dividing line.

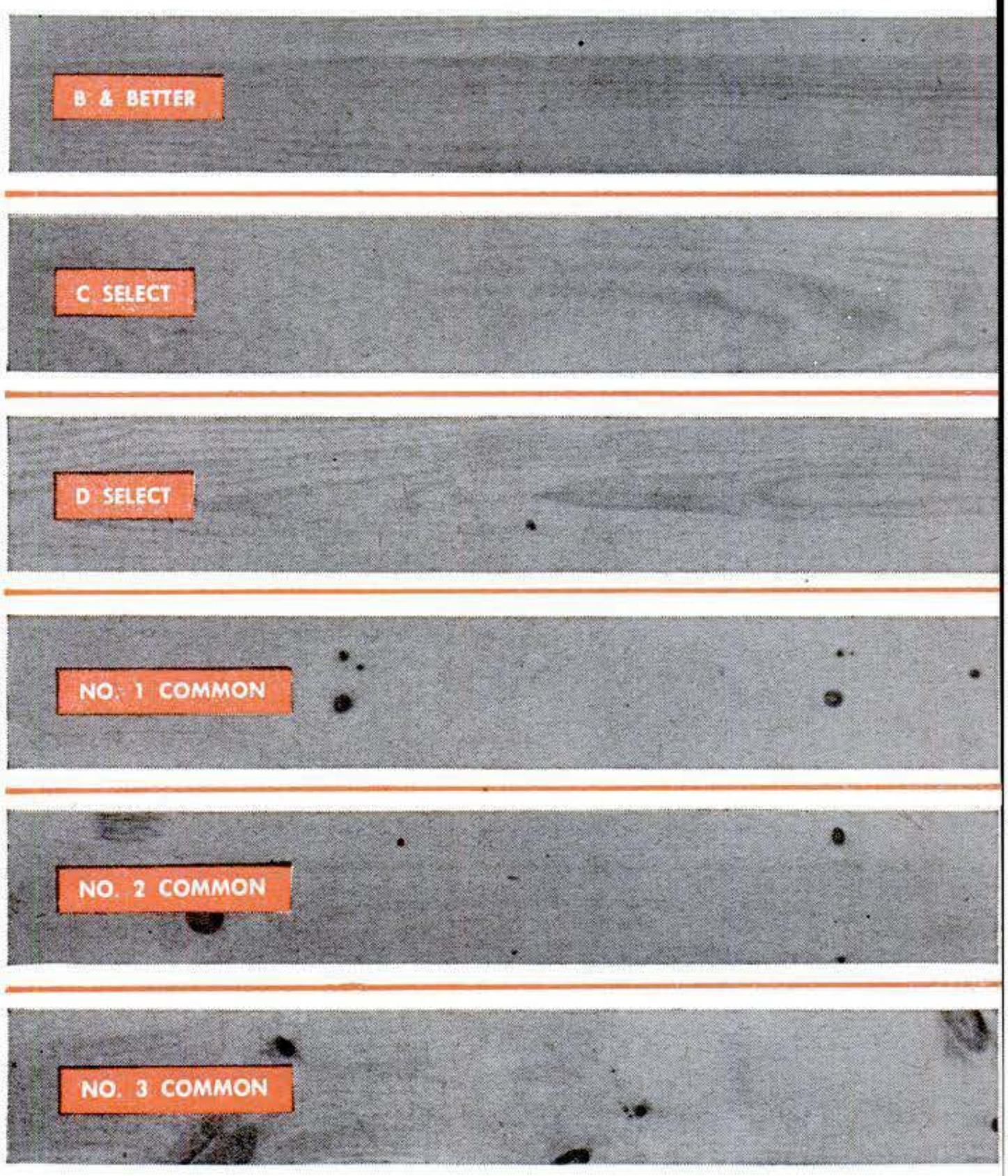
Woods are properly classified as hard or soft solely by the two groups of trees they come from. Those from broad-leaved deciduous trees (which shed their leaves each

WHEN YOU WANT BOARDS...

By BOARDS the lumberman means stock less than 2″ thick and usually over 6″ wide (narrower boards may be classified as strips). Pricewise, such stock adds up fast. Therefore it's important to buy sizes that will cut with a minimum of waste, and to get the cheapest grade adequate to the job.

Grading is not an exact science, but depends upon the judgment and experience of the grader. The American Lumber Standards permit a 5 percent below-grade variation between graders. For this reason, and also because no two pieces of wood are identical any more than two thumbprints, even photos of typical grades can give only a rough idea of what may be expected. The better face of a board governs its grading. Within limits, the back may be poorer.

At the right are the six commonest pine-board gradings. The sketches suggest typical projects for which each grade might be used.



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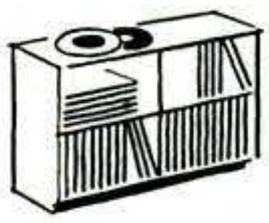
PICKING OUT your own may pay even if the dealer charges for restacking afterward. You can pick straight two-by-fours for door or window frames, clear joists where strength is critical. You are free to reject cupped or twisted stock you might get in a delivery.

SORTING CULL LUMBER is one way to save money. Short lengths of the proper width, for instance, may serve for fire stops, bridging between joists, and braces. But usually you will have to square both ends of cull stock, which means one extra cut per member.

year) are hardwoods. Those from coniferous trees or evergreens, which have needles or scalelike leaves, are softwoods. Most of the wood in the ordinary lumberyard belongs to this class.

How dry is it? If you're putting cupboards in a heated house, the wood had better be well seasoned or you'll wind up with cracks where the joints used to be. For exterior work it can be less dry, and for framing a house even poorly seasoned lumber will do in a pinch. Such wood is easy to nail, can be straightened if crooked, and will be fairly dried out, if the weather stays

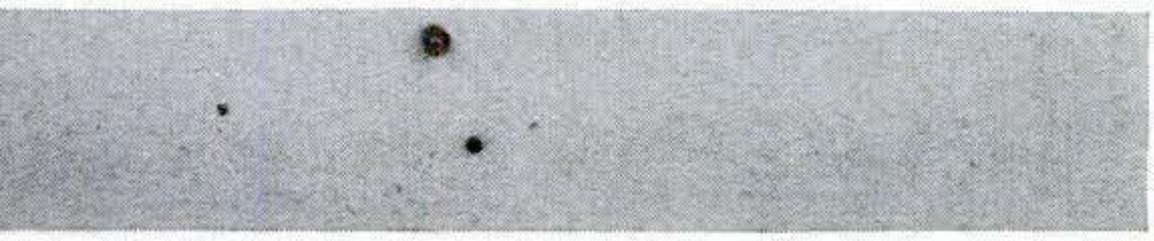


B AND BETTER (also called 1 and 2 clear) is top quality, almost free from blemishes, and practically perfect even on the back. It's a luxury unless intended for the finest natural finish.

C SELECT may have more defects, but all are minor ones such as small tight knots and small to medium pitch pockets. It will take a nice natural finish and is a fair substitute for B and Better.

D SELECT is the lowest grade of finish lumber, with medium or loose knots and other faults. The back may have more serious ones. But face defects can usually all be hidden by paint.

NO. 1 COMMON may have many small, smooth knots, all sound, none larger than about 2″, and rarely on edges. Surfacing around knots is smooth. Paint hides most but not all its defects.



NO. 2 COMMON, an all-around utility grade, has the same defects as No. 1 to a greater degree. Knots may be up to 3½″, though the average is much less. Even paint won't hide all its faults.

NO. 3 COMMON allows bigger, coarser knots, loose knots and knotholes, as well as some shake splits and pitch. Often a single large flaw will downgrade a No. 2 to No. 3.

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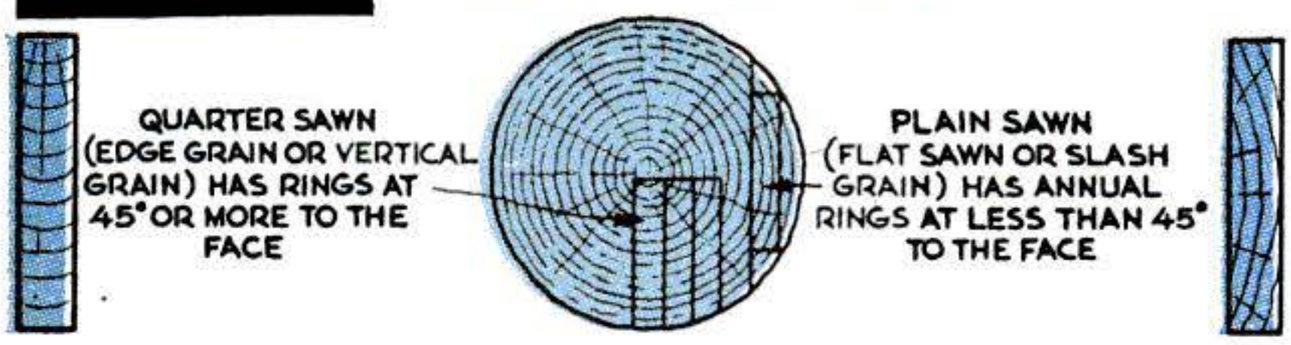
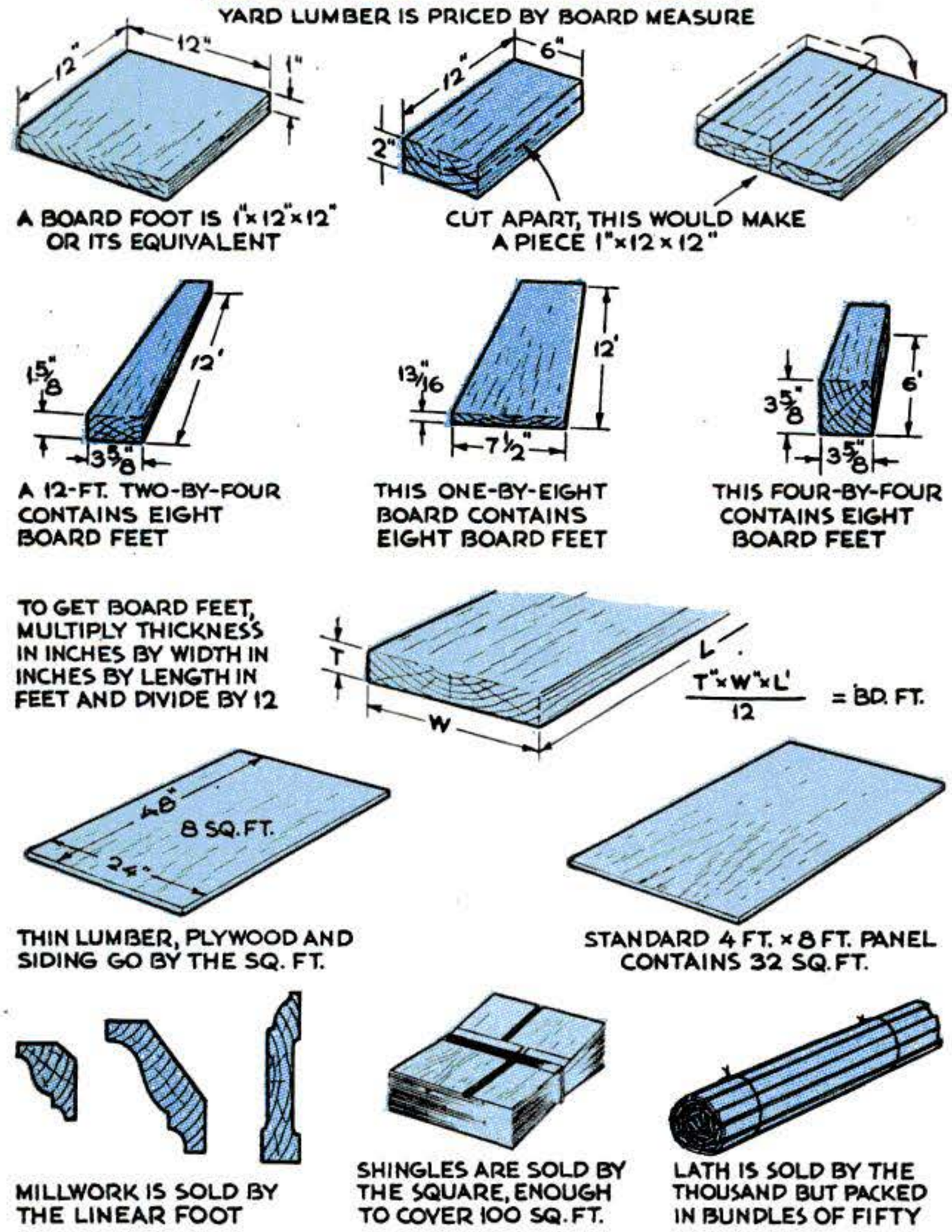
WOOD... HOW WOOD IS CUT



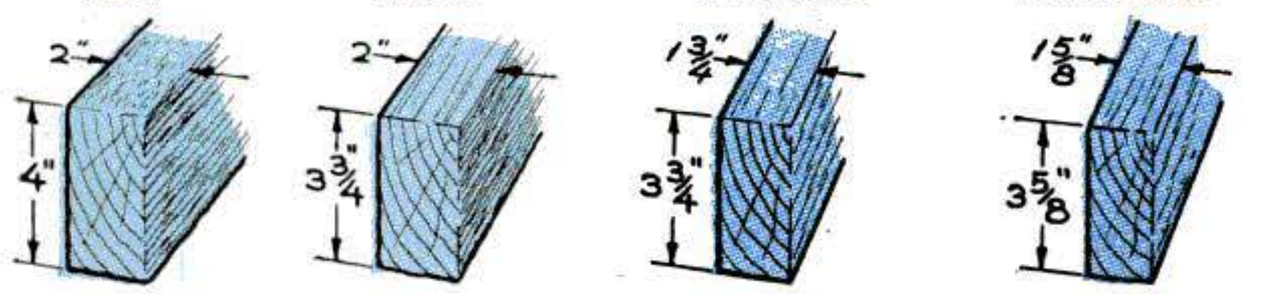
HOW YOU ARE CHARGED

YARD LUMBER IS PRICED BY BOARD MEASURE



YOU PAY for the amount of wood in a piece before surfacing. For example, stock dressed to 13/16″ is called 1″ stock and priced accordingly. A surfaced two-by-four is considered 2″ thick and 4″ wide although it measures ⅜″ less each way. A board 1 1/16″ thick will be charged for as 1¼″. Wood thinner than 13/16″ involves extra labor and more waste, so it is sold by the square foot, which is the same as taking its thickness to be 1″.

HOW A TWO-BY-FOUR DWINDLES



WHY IT MEASURES LESS than the size you buy. Shrinkage accounts for some of the difference, surfacing for the rest. Standard 1″ boards dress to between ¾″ and 13/16″ thickness, lose ⅜″ to ½″ in width.

good, by the time you get around to enclosing it.

Green wood may be so wet it spouts water when a nail is driven in. You can sometimes buy unseasoned stuff so much cheaper that it may pay to "stack and stick it" yourself for air drying (see PSM, Nov. '51, p. 177). Or you may be able to put it up green in such a way that the opening of joints won't show. One dodge is to nail battens along the joints to one board only, and nail them to the other only after shrinkage has occurred. The wood is, of course, left unpainted. Remember that wood shrinks least lengthwise, and most across the grain. In a long board, however, even lengthwise shrinkage can open a corner joint half an inch.

If you want to test wood for moisture content and shrinkage, saw off a piece 1″ long and exactly 6″ across the grain. Weigh it carefully. Bake in the oven at 212° for at least four hours. Then measure it or compare it to an undried piece of the same stock. If you want moisture content, find the difference between wet and dry weight, and divide the difference by the dry weight. Example: a piece weighing 12 oz. originally and 8 oz. after drying (difference 4 oz.); dividing 4 by 8 gives ½, or 50 percent moisture content.

For interior applications such as trim and cabinets, lumber should be kiln-dried. Such stock may have from 6 percent to 12 percent moisture content. Framing lumber may be either kiln- or air-dried and have up to 20 percent moisture. Anything with more than that is usually considered green lumber. Beware of painting such wet wood; chances are the paint will not hold, but only retard seasoning.

Rough, surfaced and worked. Lumber comes from the saw cut to nominal sizes such as two-by-four, two-by-six, four-by-four, and so forth. In this form it is classified as "rough." Run through a planer, it is known as "surfaced," and dwindles in size by the amount of wood removed. A nominal two-by-

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four surfaced on four sides (S4S) thus shrinks to 1⅝″ by 3⅝″ in cross section, a one-by-six board to 25/32″ by 5⅝″. A "five quarter" board, nominally 1¼″ thick, comes to 1 1/16″ when dressed.

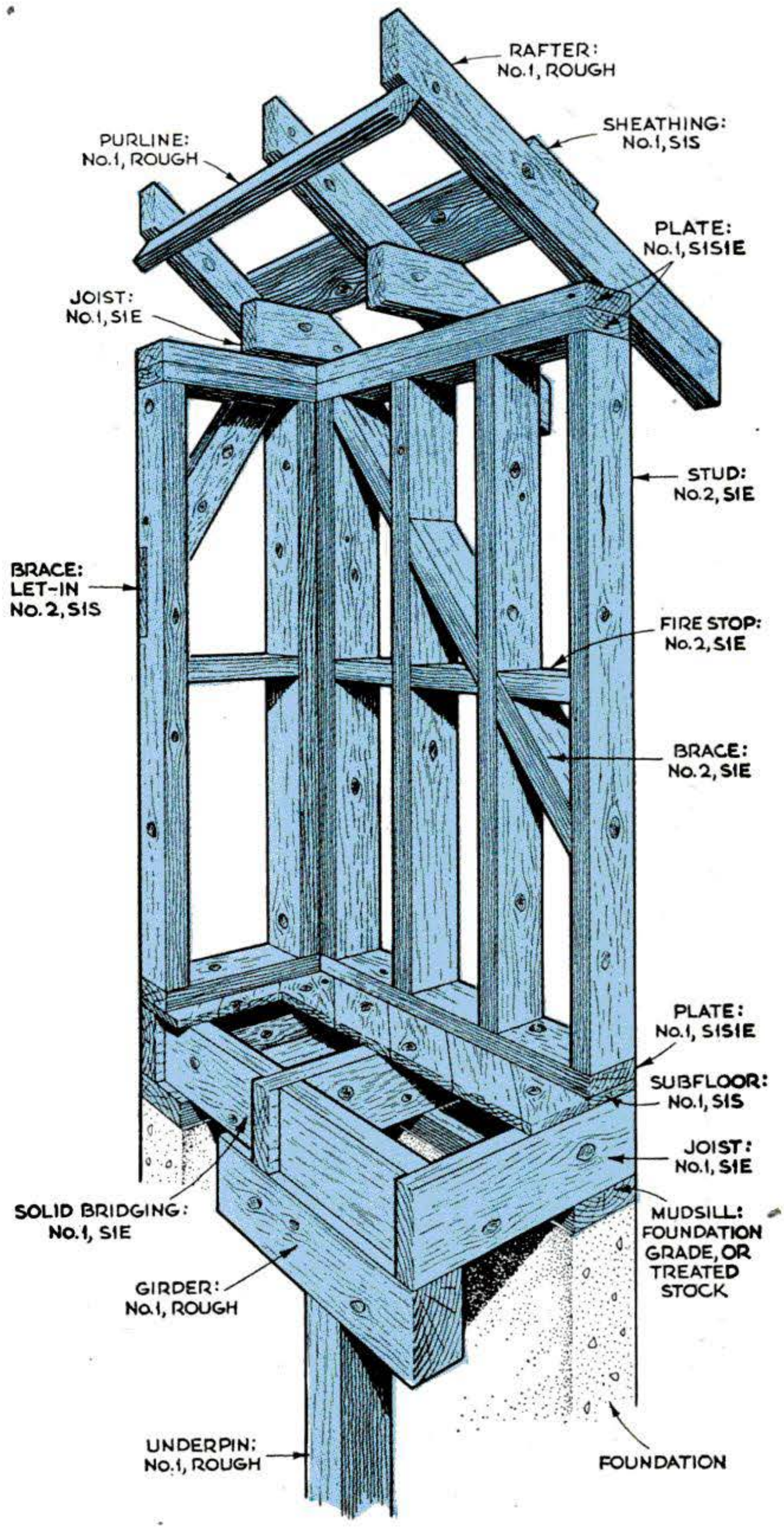
Some lumber can be bought surfaced two sides (S2S) or one side and one edge, and so forth. Rough lumber, if available, is a good choice for some jobs, although hard on the hands. Rough rafters may be okay, for example, while rough studs may cause trouble, since differences in width would make the walls irregular. Dressed or surfaced lumber, on the other hand, is uniform. Planing straightens the pieces and makes the sides and edges parallel. Uniform width or thickness is important when pieces are to form an even surface for further construction. Studs in a wall, for instance, are placed on edge and therefore should be sized across the width on one or both edges. The same is true of floor joists. It's wasteful of time to lay odd widths and then dress them to match.

A third classification, "worked" lumber, refers to stock that has been run through a molder or similar machine and made into siding, casing, bead or molding.

Surfaced, or sized, lumber is grouped in three categories: *Yard lumber* includes boards and dimension lumber up to 5″ thick. *Structural timbers* are 5″ or more. Both groups are graded as to quality with the use of the entire piece in mind, therefore a bad defect downgrades the piece. *Factory and shop lumber,* on the other hand, is meant to be cut up and permits defects between usable sections. This grouping has special interest for the craftsman (see page 218).

How wood is graded. All but the most expensive lumber has defects. Grading regulates the size and number of these. You should know enough about grading to buy the cheapest lumber suitable for your purposes and also to recognize inferior grades if they are sent to you by mistake. The safety and durability of a garage or house

FRAMING GRADES



TYPICAL USES of No. 1 and No. 2 common framing lumber are shown above. In general, members used in a horizontal position are under greater stress and should be No. 1 grade. For vertical members such as studs, No. 2 is adequate. Initials in above drawing refer to dressed members: S1S meaning surfaced one side; S1E, surfaced one edge; S1S1E, surfaced one side and one edge. Accurate sizing assured by surfacing is important where pieces form a base for a flush surface. Wall studs, floor joists are examples.

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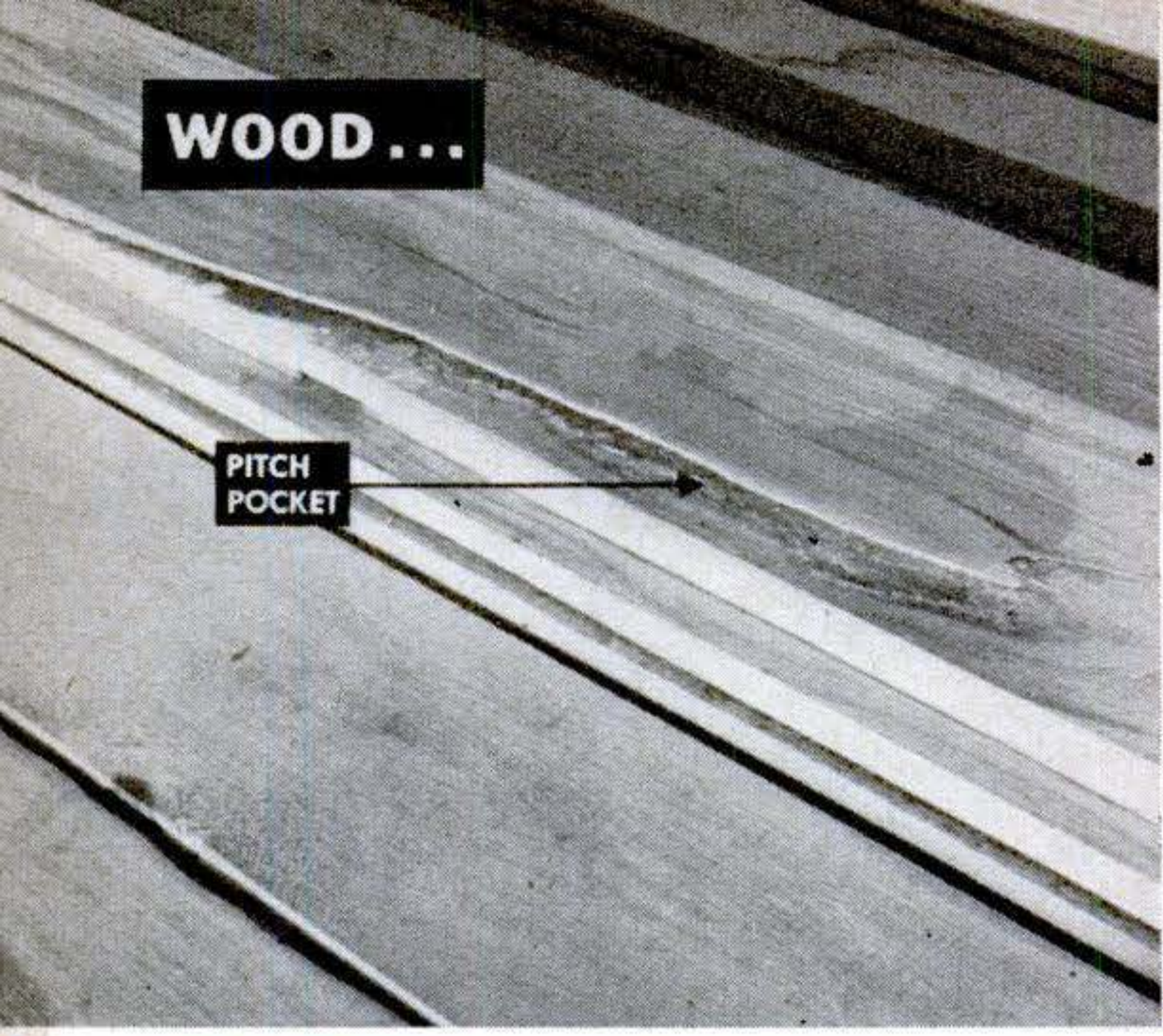
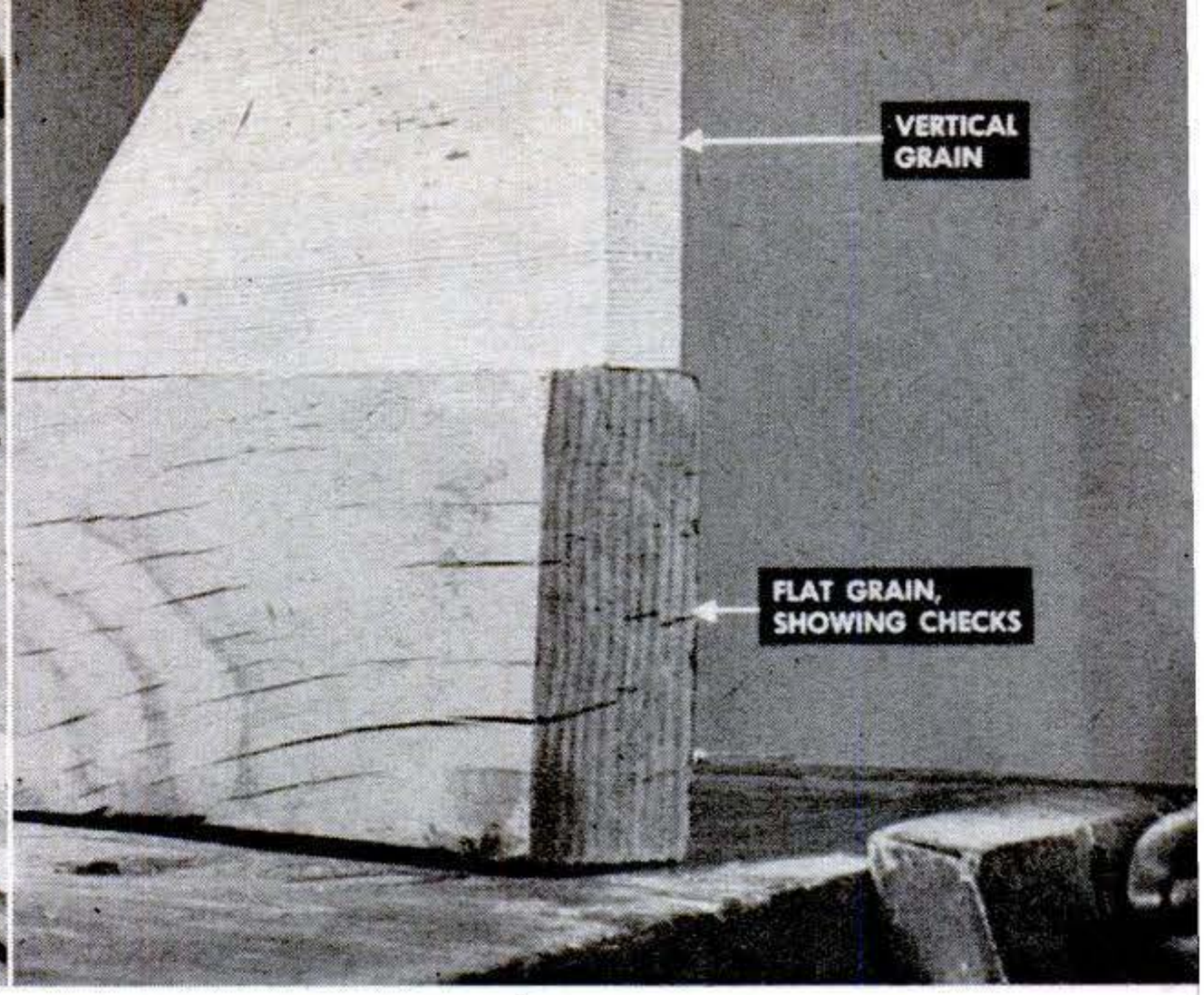


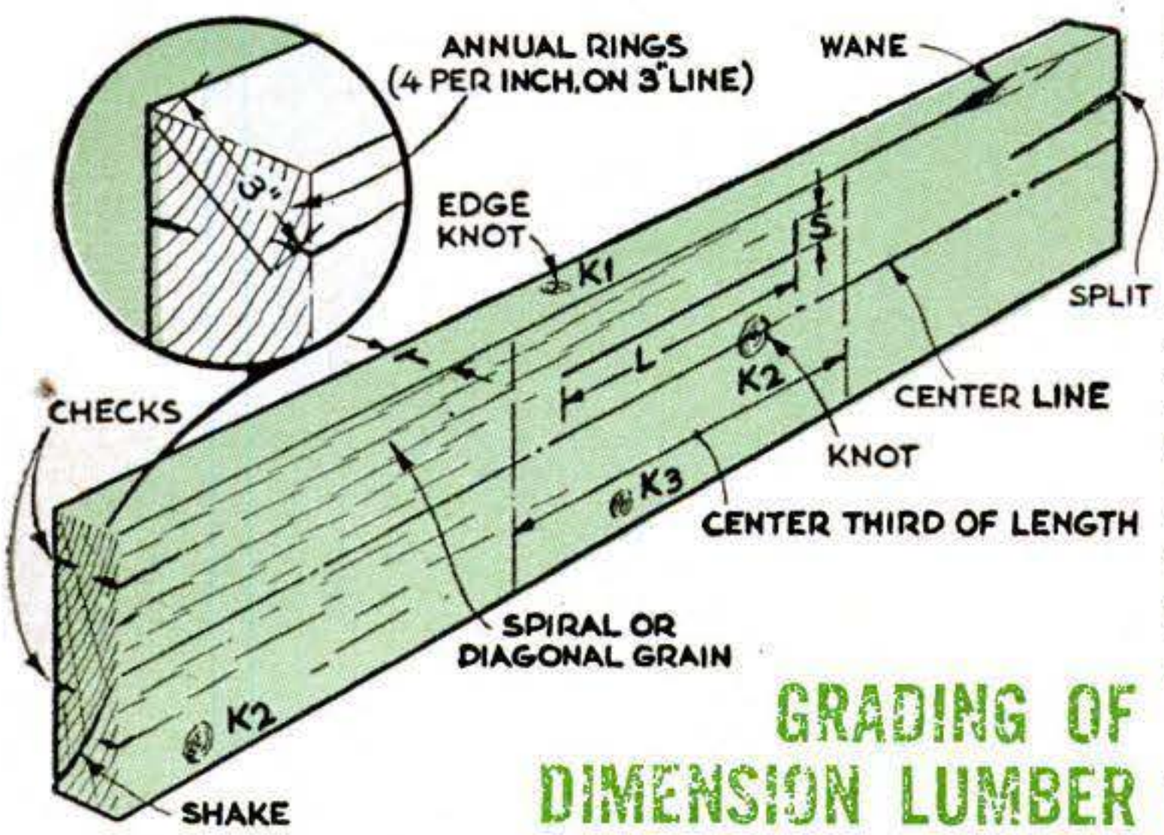
PITCH POCKETS, open seams containing liquid or dried resin, spoil a board as far as they reach when as big as this one. Small pitch pockets are harmless except for their sticky drippings. Decay spots weaken the piece as much as knots the same size.



PLAIN AND QUARTER-SAWN. Top piece was quarter-sawn, cut across the annual rings. Lower one was plain or flat-sawn, cut tangent to the rings. Plain sawing is less wasteful, produces wider boards. Quarter-sawn stock has attractive grain, shrinks and splits less.

addition may depend upon your caution. Where building inspectors check on construction, you may have to rebuild anything in which less than required grades have been used.

In grading framing lumber, strength is the chief criterion. For this reason not only the size of the defects and whether they're sound or loose, but also their location is taken into account. A knot near the end of a two-by-four impairs its strength less seriously than one in the middle or near the edge. Therefore larger end knots are allowed. Checks (end cracks) may be only one-fourth the thickness of a piece of No. 1 common, or if two checks are opposite each other, their total must be no more than one-fourth of the thickness. In No. 2 common this tolerance goes up to one-third. An accompanying diagram shows these grading principles.



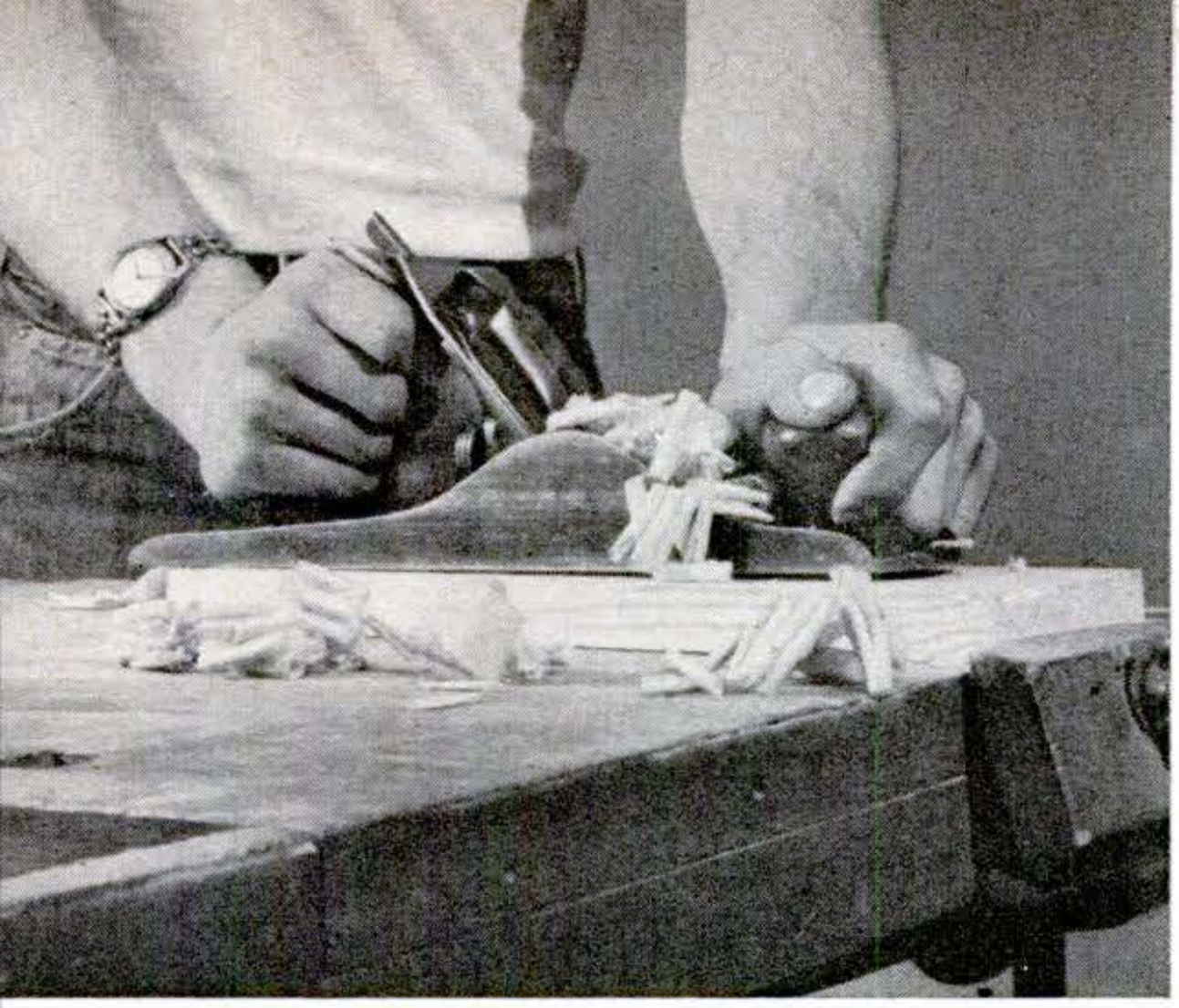
GRADING OF DIMENSION LUMBER

HOW IT'S GRADED. In framing lumber, the size of permissible defects is a fraction of the width or thickness (W or T). Where they may appear is shown above. Example: in No. 1 common, K3 may be W/4; that is, face knots near one edge in the center third of the length may be one-fourth the width in diameter. On the center line or at end (K2) knots may be a third the width in size. Edge knots (K1) may be T/3. Spiral or diagonal grain is measured in center of piece as slope (S) in a given length (L)—1 in 10 for No. 1 common, 1 in 8 for No. 2.

Money-saving tips. Besides using the lowest serviceable grade for the job in hand, you can sometimes trade time for a cash saving by picking over cull lumber. Plenty of split and otherwise damaged stock is usable. But it may require extra sawing to square off the ends, and only you can decide whether it pays.

Milling defects sometimes put lumber on the bargain counter. Hit-and-miss surfacing, in which the knives missed low sections, still leaves boards suitable for sheathing and subfloors, for instance. Some price arithmetic will show whether such stuff is worth buying.

Large beams, like those over wide garage doors, can be bought as timbers, but inside defects may be hidden and the pieces are hard to handle. A good alternative is to spike two pieces of 2″ stock together side to side. Another lumber-saving dodge, build-



YOU CAN TELL well-seasoned wood by the curled, silky shavings a plane turns up, which do not choke the throat of the tool. Rapped with the knuckles, dry wood has a clear ring unlike the sound from green stock. Poorly seasoned wood may shrink still further.

ing regulations permitting, is to use two-by-four ceiling joists over halls and for spans of 10′ or less.

Weaknesses in rafters and joists that show up after they are in can be corrected by nailing "scabs" of 1″ stock on each side of the piece. They should extend about 2′ each way beyond the defect. Studs bowed edgewise can be straightened by making a saw cut in the concave edge and expanding it with a wedge, afterward reinforcing the spot with scabs.

It's a good idea to clamp the member against a stiff, straight piece before you nail on the scabs.

Clear stock for porch columns comes high. A stained or natural finish can be satisfactory even if there are a considerable number of firm knots. For a painted finish you can use even rough or knotty pieces. Chisel back the knots, plug the holes with wood held in with waterproof glue, and fill rough spots with a good surfacing putty or fine sawdust mixed with waterproof glue. Sand well all over when the glue has set.

It's good practice to set door and window jambs before plastering, letting them take the place of plaster grounds. If you want the best finish in the least time, use kiln-dried B and Better, vertical grain. This grade allows only two or three pitch pockets in a 12′ length of 8″ board, no knots or skips on the face, and no cupping.

If you can pick your own jamb stock and

WHAT WOOD WILL YOU USE?

Coast to coast, our forests offer a variety of useful building lumber. Your dealer will ordinarily stock the kind that grows nearest and therefore costs least to haul to his stacks. It will usually cost you less, too.

Douglas Fir (also known as Oregon Pine) is neither fir nor pine but a species in its own right. It is very strong for its weight, resists soil moisture and decay, takes a good finish, and is made into plywood, doors and trim as well as framing stock.

White Pine (also known as Northern, Eastern and Canadian White Pine) grows from the East Coast to Minnesota and as far south as Georgia. It is much used for millwork as well as framing, is easy to work and less resinous than other pines.

Idaho White Pine (Western White Pine) has characteristically colored small tight knots. Better grades are used for the same purposes as Northern White Pine, while the lower grades are used for construction lumber and knotty-pine paneling.

Ponderosa Pine (California White Pine or Western Yellow Pine) has a number of regional names but is not truly a white pine. It is much used for millwork. If it will be exposed to weather, it should be treated to resist moisture.

Southern Pine (Southern Yellow Pine) takes in loblolly, pond, slash and other pines growing from Virginia to Texas. Some is known commercially as North Carolina Pine. Uses run from structural timber to molding.

Eastern Hemlock is found as far west as Wisconsin. West Coast Hemlock is often intermixed with Douglas Fir, and can be had in wide sizes of vertical-grain boards.

Redwood is also a West Coast wood, valuable for purposes ranging from ceiling to sheathing. Free from resin, it takes paint well and is resistant to weather and decay.

Cedar and Cypress are useful for sheathing, exterior trim, and siding.

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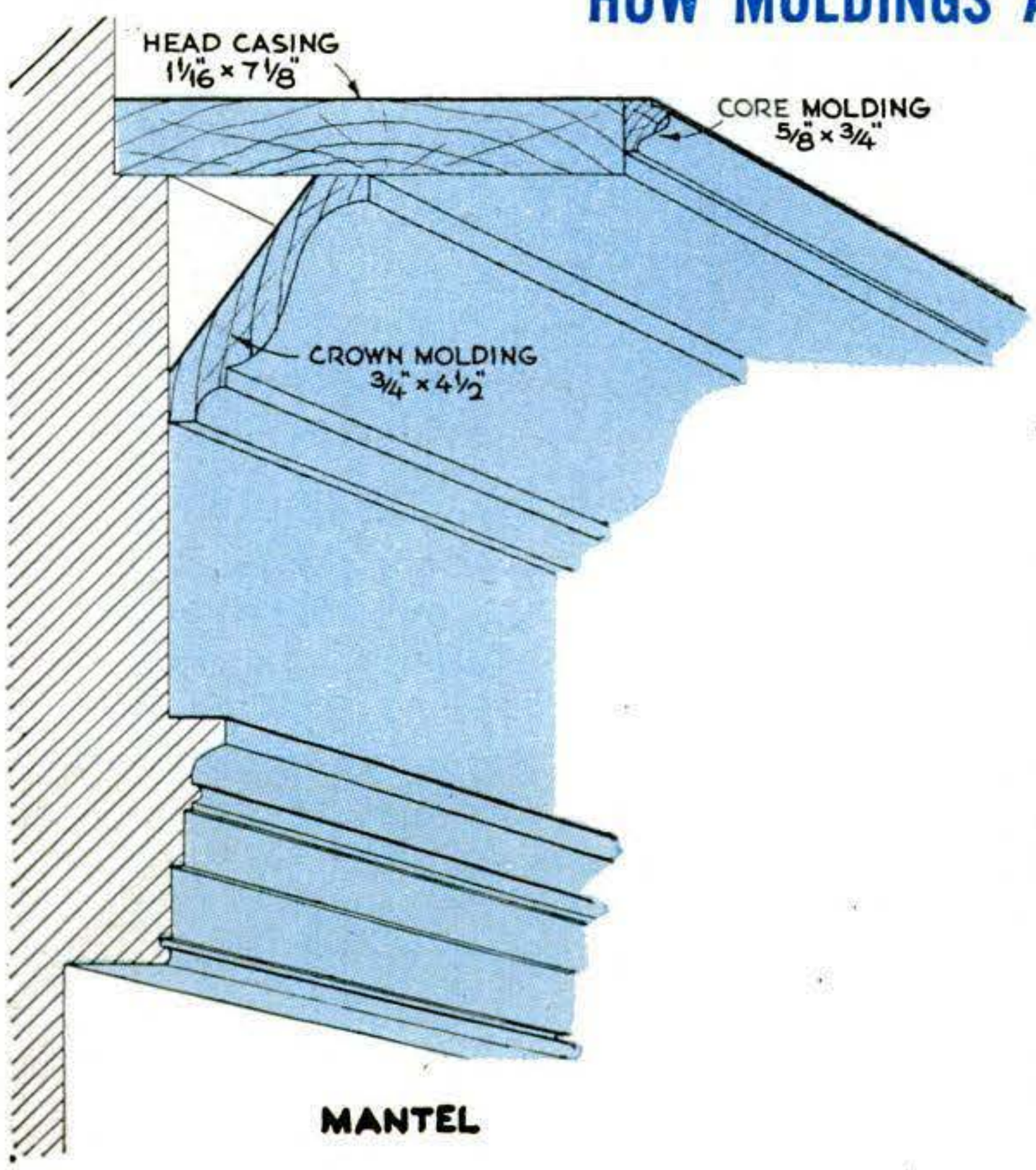
WOOD...

are sure of getting straight pieces, buy as near finished width as possible. For delivery, sight unseen, better get it wider so that edges can be jointed straight without making the material too narrow. This also applies to "pulley stile," or jambs for double-hung windows already grooved for the parting bead. If this material is bowed edgewise, jointing the edges will still leave the groove curved.

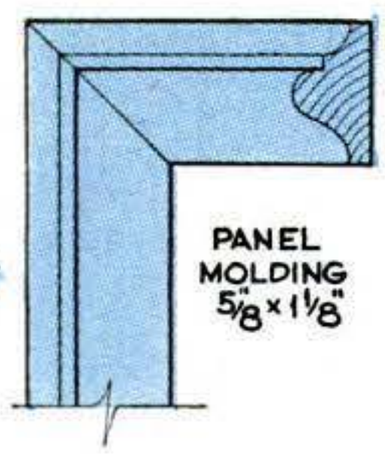
Unless you are certain of getting worked stock that is straight, you'd better buy plain boards and groove it yourself after jointing to width.

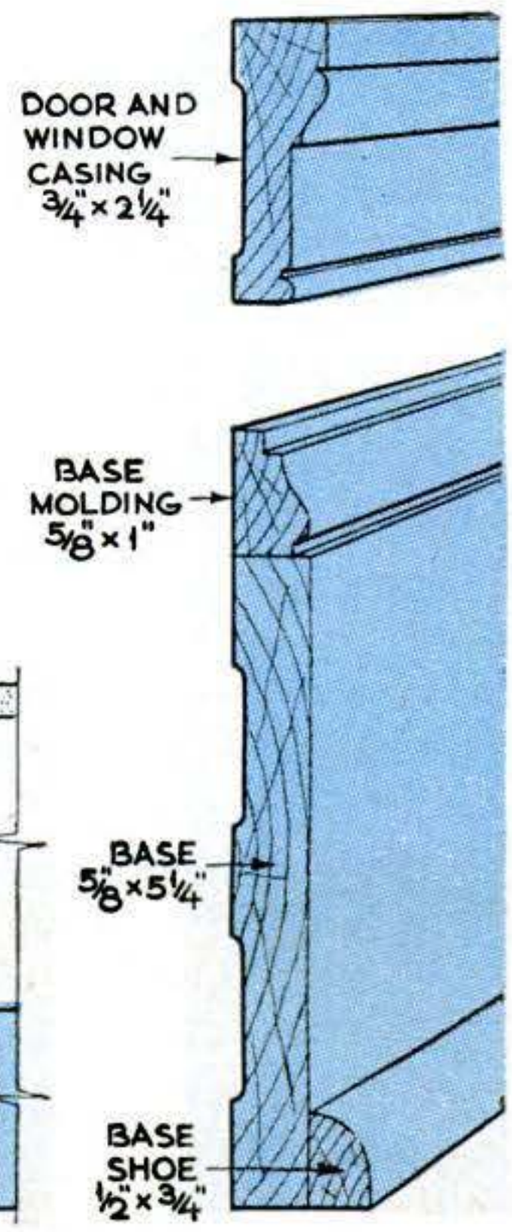
Grain appearance is a clue to how well the wood will hold paint. Flat-sawn lumber with wide slashes of hard grain may flake paint off the hard parts. If hard grain appears as threads, it should hold paint well, but the broad hard grain of summer wood makes a board a poor prospect for painting.

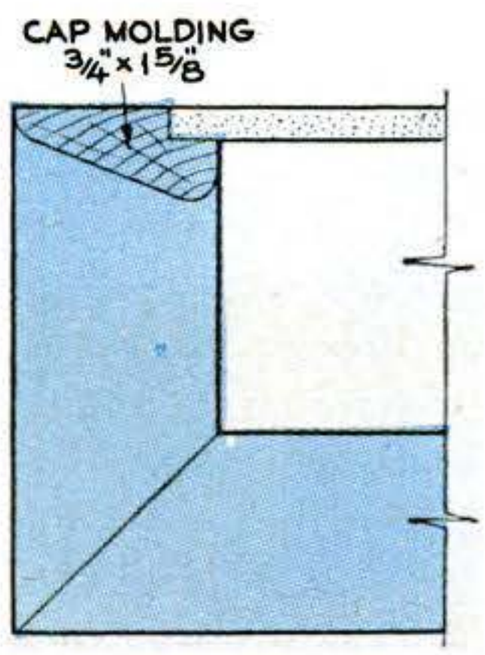
HOW MOLDINGS ARE USED



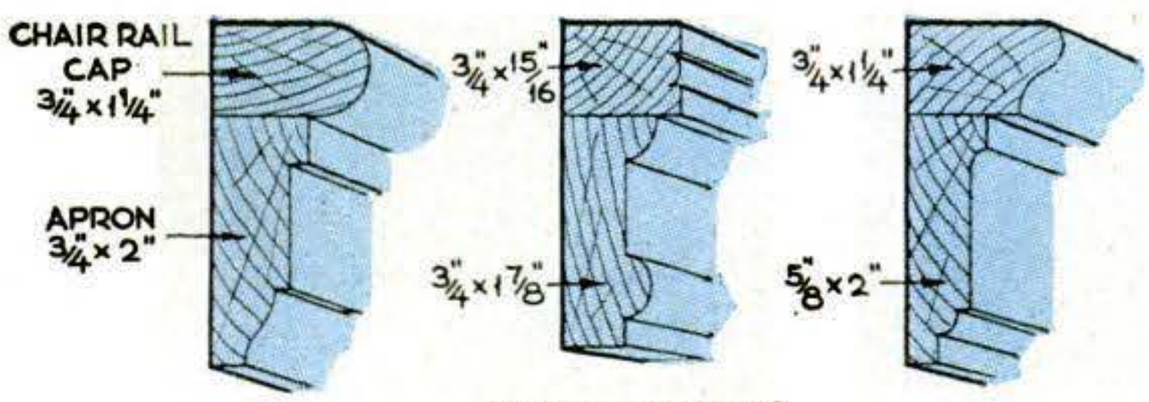
MANTEL



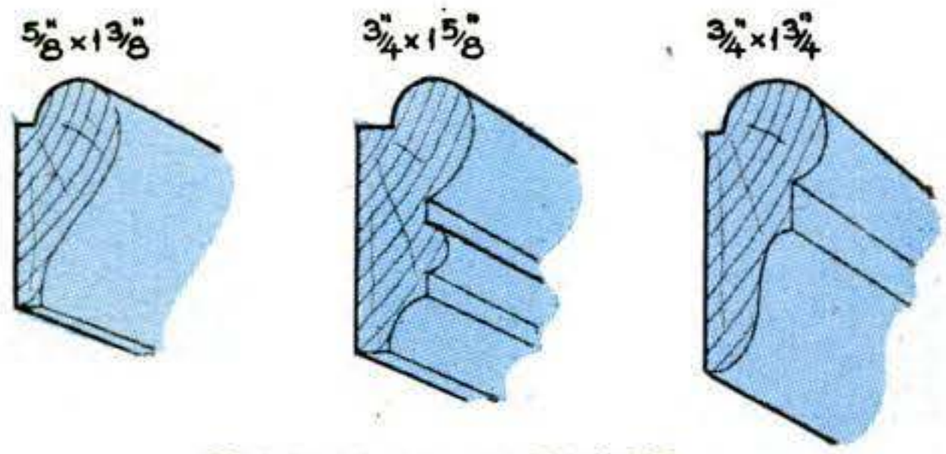




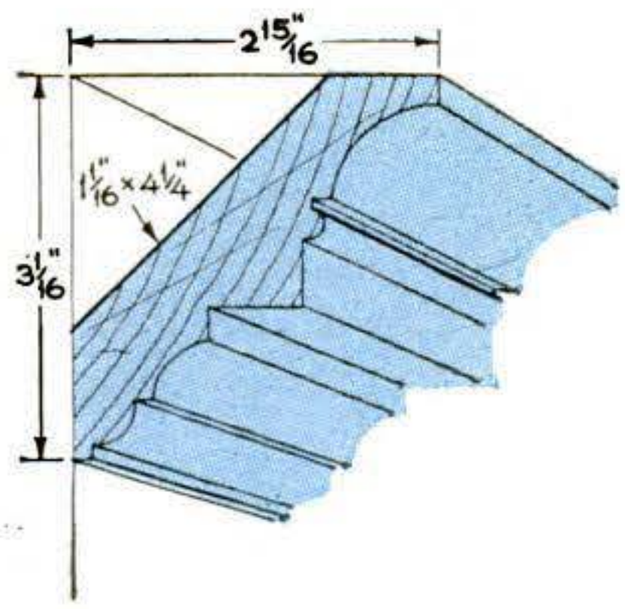
BULLETIN BOARD

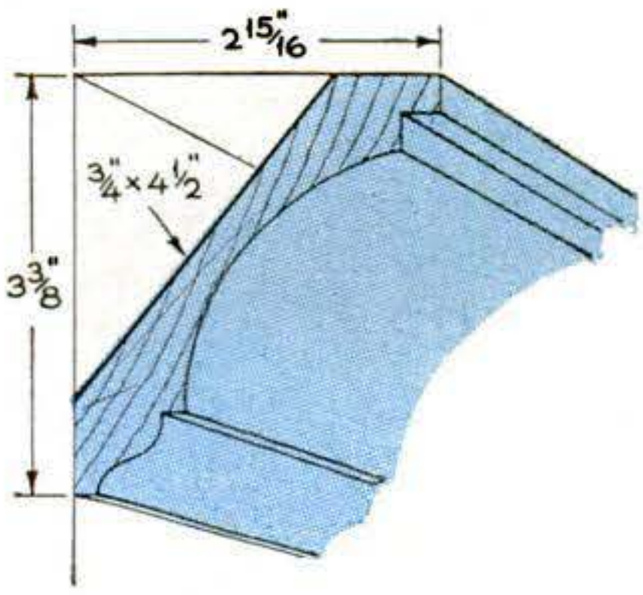


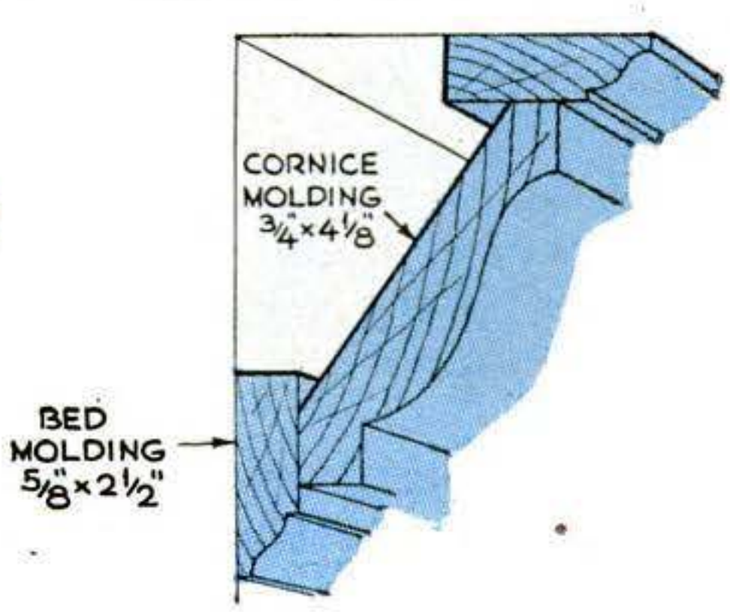
CHAIR RAILS



PICTURE MOLDINGS







CORNICES

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Tailored wood panels come bigger than the trees. They can save you a lot of work.

Shopping for Plywood

By John Rogers

NO CRAFTSMAN should pass up the great advantages of plywood. It's the ideal material for all sorts of projects ranging from outdoor playhouses to furniture.

You can choose plywood for weather resistance, beautiful grain, plain toughness, flexibility or a combination of these. Often it will save you an enormous amount of work by eliminating framing.

The trick of gluing together layers of wood goes back to the ancient Egyptians, who left some nice examples. Yet until recent years veneered furniture carried a stigma because of a tendency to come unstuck or peel in time.

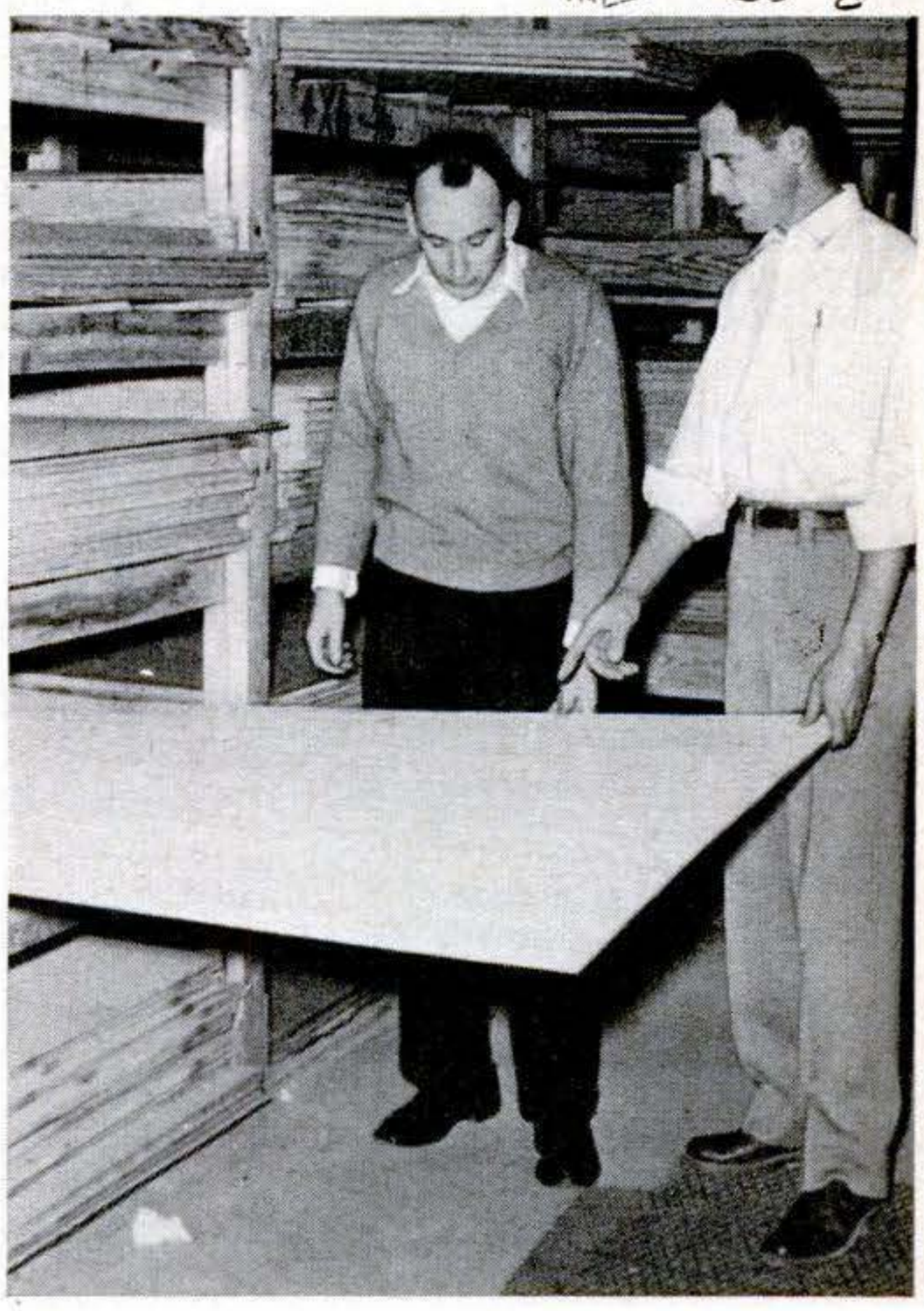
Plastic-resin adhesives and modern plywood presses have laid that ghost. Today's plywood is more resistant to splitting, warping and shrinking than natural wood. Pound for pound, it is stronger than steel.

Core construction. If you look at plywood edges, you'll find two main kinds. Some plywood has a comparatively thick middle layer of solid wood, with a 1/16″ layer on each side and the very thin face veneer (1/28″ thick) outside. This is *lumber-core plywood.* It is just the thing for projects like furniture, which call for doweled, splined or dovetail joints.

Fir, pine and some hardwood-veneer plywoods may show three to seven layers of similar thickness on the edge, with the grain of adjacent plies at right angles. This is *veneer-core plywood.* It is cheaper but not as desirable where edge joints must be made or where edges will be exposed.

Will it stand weather? Plywood is manufactured with different kinds of adhesives for various kinds of service. If you are paneling a rumpus room or building a bookcase, the interior or moisture-resistant type is fine. For an outdoor playhouse, signboard, or other job exposed to weather, you will want the exterior type. This will stand up under permanent exposure without going to pieces. Since it costs more, it is a luxury where exposure is not a factor.

If your fancy runs to boat building, you



STANDARD PANELS are 4′ by 8′, but many yards have a stockpile of smaller sizes. Type and grade are marked on panel edges. When you cut one up, mark pieces for identification.

PREGROOVED PLYWOOD combined with louvered doors, wire grilles and scrollwork make this unusual dividing wall. The grooved panels simulate planking, but are easier to install.

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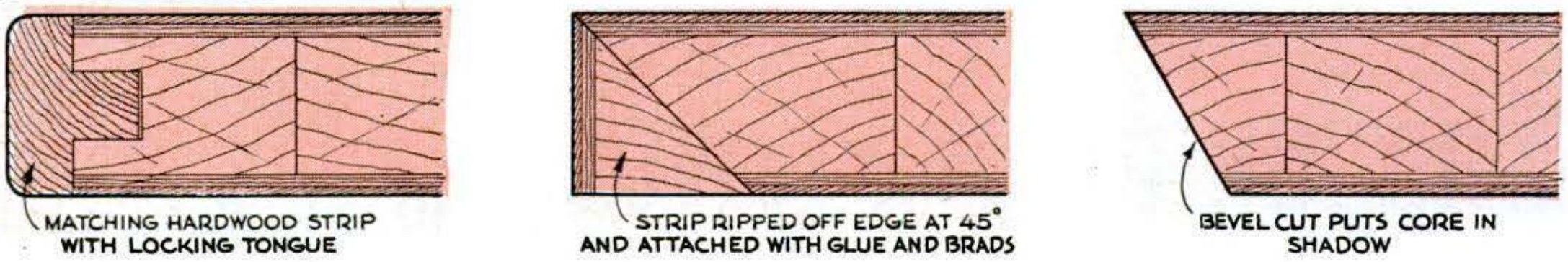
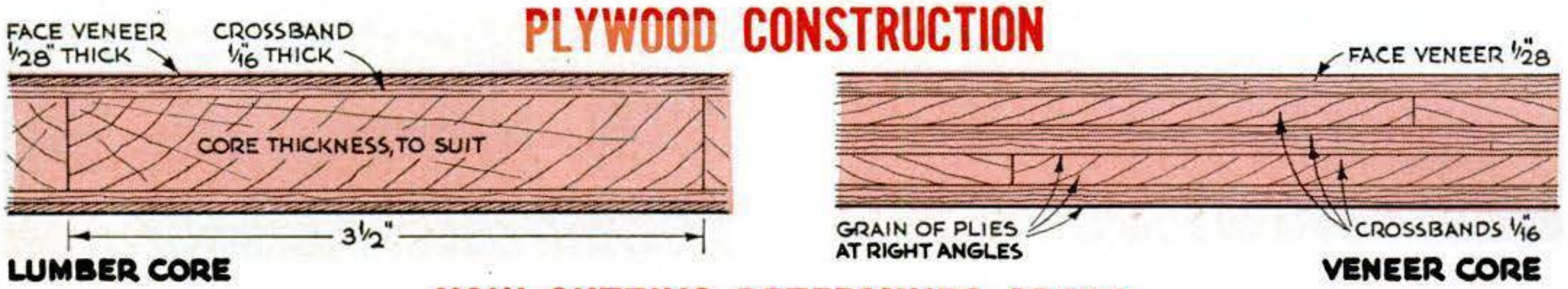
THREE WAYS TO HIDE EDGE GRAIN



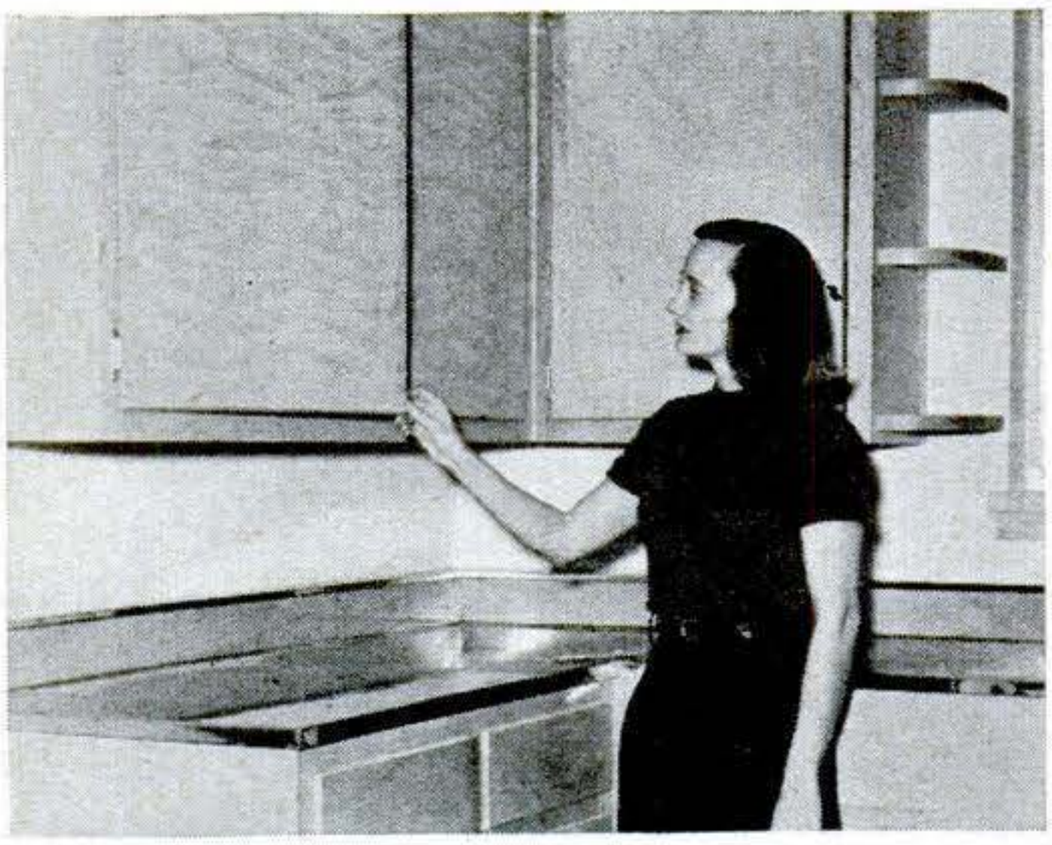
PLYWOOD CONSTRUCTION



HOW CUTTING DETERMINES GRAIN

are in the market for a third type—marine plywood. This can be had in fir, mahogany, birch, spruce and cedar. All three types are clearly identified on the panel edges.

The face woods. Veneers for plywood are cut three different ways. For common fir plywood, it is usually rotary cut—sliced off the logs as an apple is peeled. This gives it a wild zigzag grain that is hard to hide or sand out. Other veneers are quarter-sliced or flat-sliced. Each method produces its own characteristic grain. By the last two methods, slices can be pieced together for matched-grain effects.



HARDWOOD-VENEER plywood makes beautiful kitchen cabinets. Doors are self-supporting without framing. Clear lacquer finish leaves the attractive grain fully visible.

Fir plywood, the most economical, comes in a number of grades differing in surface quality and price. The best buy for general utility and for projects in which grain appearance does not matter, it comes in thicknesses from ¼″ to 13/16″. The standard panel is 4′ by 8′, but many yards have a stockpile of smaller random sizes.

Ponderosa-pine plywood is widely used for interior paneling and furniture making. Its clear white color makes it ideal for natural or color-stain finishes. You can also buy it prefinished.

Hardwood-veneer plywood is available in over 30 woods. The veneers are variously cut to obtain the most beautiful grain possible, and panels with matching grain can be had. Face woods include birch, butternut, bubinga, cherry, elm, gum, harewood, mahogany, oak, teak and many others.

In addition to plain panels, some hardwood veneer plywoods come in checkerboard panels, in prefinished, edge-grooved wall panels, and random-grooved panels.

Plywood grades. All fir-plywood panels are clearly edge-marked with their type and grade. By careful buying you can stretch your shopping dollar. Why cut a cabinet back from the best grade at 20 cents a foot if 12-cent wallboard grade will do?

The quality of the two faces of a panel determines its grade. A "good" face consists of a single sheet of smooth, clear ve-

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neer. A "sound" face may consist of two pieces of veneer per panel, perfectly joined but with small imperfections such as patches, stains or sapwood. A "utility" face may have knots, pitch pockets, knotholes and splits (up to 1/16″ wide) that impair the looks but not the strength of the panel.

Obviously the best grade has two good sides (designated as G2S). This grade is called for when both sides will show and are to have a finish revealing grain. Where only one side will show, a "good-one-side" panel (G1S) will save you about a nickel a square foot. The other side is sound.

For projects that are going to be painted, the sound-two-sides (S2S) grade or even (when only one side will show in the finished job) sound-one-side (S1S) will do. Wallboard grade (WB) has a sound face and utility back. Sheathing (SH) has two utility faces and comes unsanded, in 5/16″ to ⅝″ thickness. A special grade for concrete forms, made with highly water-resistant glue, can be used again and again. The edges of this ¾″-thick panel are sealed with paint, and the faces are oiled.

Another marking system designates faces as A, B, C and D. Therefore an A-A panel would have two good faces, one marked A-C a good face and utility back, while sheathing might be marked C-D or D-D.

Occasionally your yard may have reject panels, at savings of two to three cents per square foot. Some will be sanded, others not, and the defects for which they are rejected will vary greatly. Unless you can pick them out yourself, they may not be a good buy. Photos on the following page show how, with some extra work, you can save money by using the lower-grade panels.

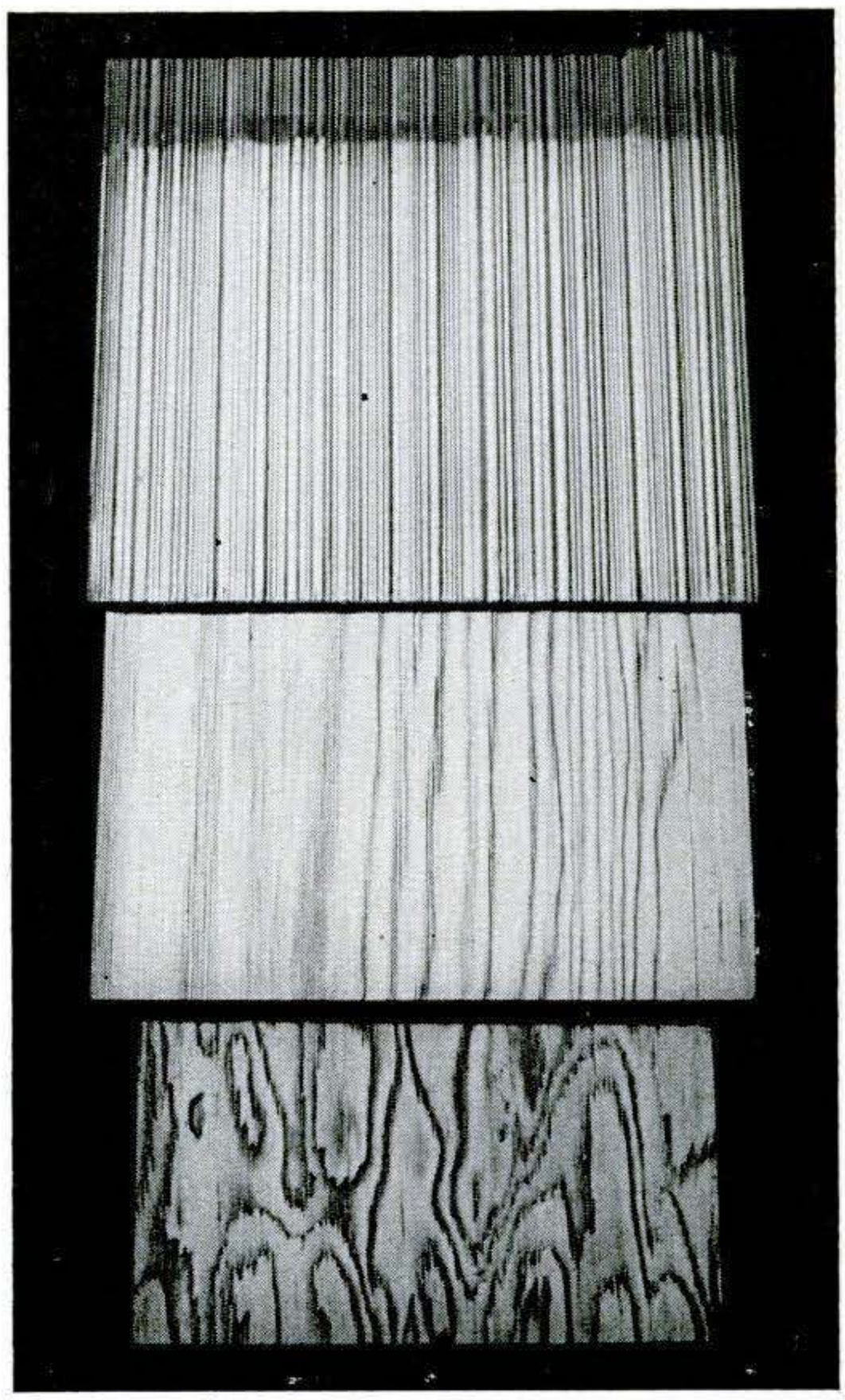
Special surfaces. Striking effects are achieved by texturing the surfaces of plywood panels. A series of machine-cut grooves all over the face, for example, produces a novel striated effect. Besides concealing the wild grain, this also disguises butt joints between panels so that no molding is required over them. Striated plywood is popular for interior wall paneling, and cheaper than hardwood veneers. It can be finished natural, stained, or painted.

Striated plywood is also made for siding. This is a three-ply exterior type ⅜″ thick, precut 15⅞″ long and 48″ wide. It is somewhat cheaper than standard siding and faster to install.

Another surface treatment is produced by wire-brushing, which cuts down the soft parts of the grain faster than the hard, leaving these in relief. This kind comes in regular 4′ by 8′ panels and also in panels grooved to simulate planking.

Hardboards are first cousins to plywood. Made of wood fibers, these tough, smooth sheets have many advantages all their own. An article in next month's issue will tell all about them.

Finishing plywood. Rotary-cut fir plywood is notorious for its wild grain. A good sealer such as Rez or Firzite will make finishing easier. Lacquer or wax may be used for a quick, durable one-treatment finish. Color stains produce striking modern effects. Striated and wire-brushed surfaces respond well to two-color treatment.



TEXTURE TREATMENTS either emphasize face grain or disguise it. Weldtex (top) is fir plywood, machine-grooved to produce a striated panel. Malarkey Shadowood (center) is available in both clear and knotty redwood with the soft grain wire-brushed down. Wedge-Wood (bottom) has a rotary-cut hemlock face treated to give a sculptured effect.

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WOOD...

Don't let cost scare you away from plywood. Here's how to use the cheaper grades.

More Plywood for Less Money

By Paul Corey

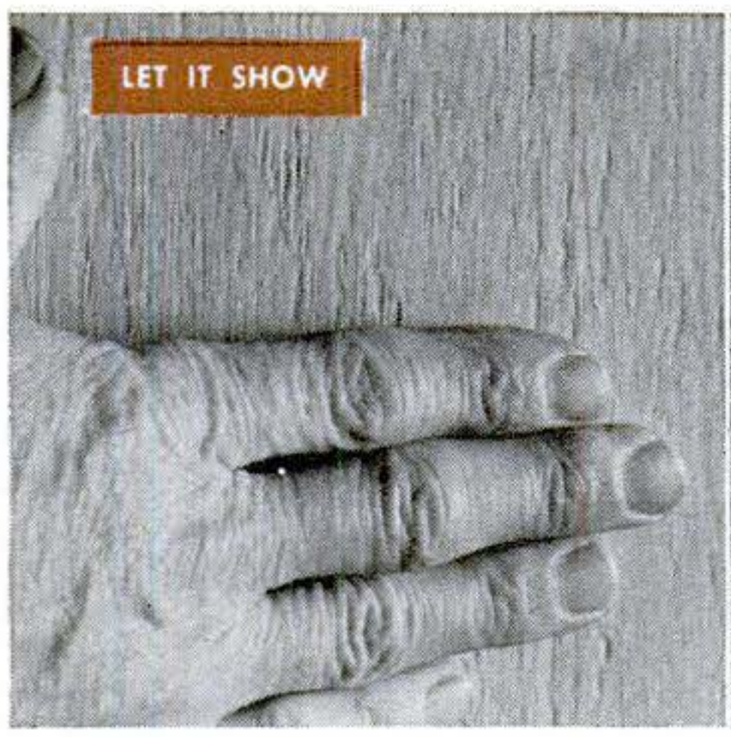
IF the going rate for standard "sound-two-sides" or "good-one-side" plywood panels has you stopped, consider what you can do with muscle instead of money. The cheaper grades of fir plywood are not sold for interior finish, but you can use them by putting in some extra work. You can then bank the difference.

Occasionally a lumberyard will have a stock of "reject" panels. These may have excessive splits, open knotholes, or patches. Again, they may be almost indistinguishable from better grades. Sometimes they are sanded, sometimes not.

Even if your yard has no rejects, it certainly carries sheathing grade. This comes in three-ply panels 5/16" and ⅜" thick, and in five-ply panels ½" and ⅝" thick. Neither face is sanded, but it costs little more than half the price of the top grade.

Examine the panels carefully to make sure you're putting their best faces forward. Then use one of the tricks shown in these photos to suit your plans and pocketbook.

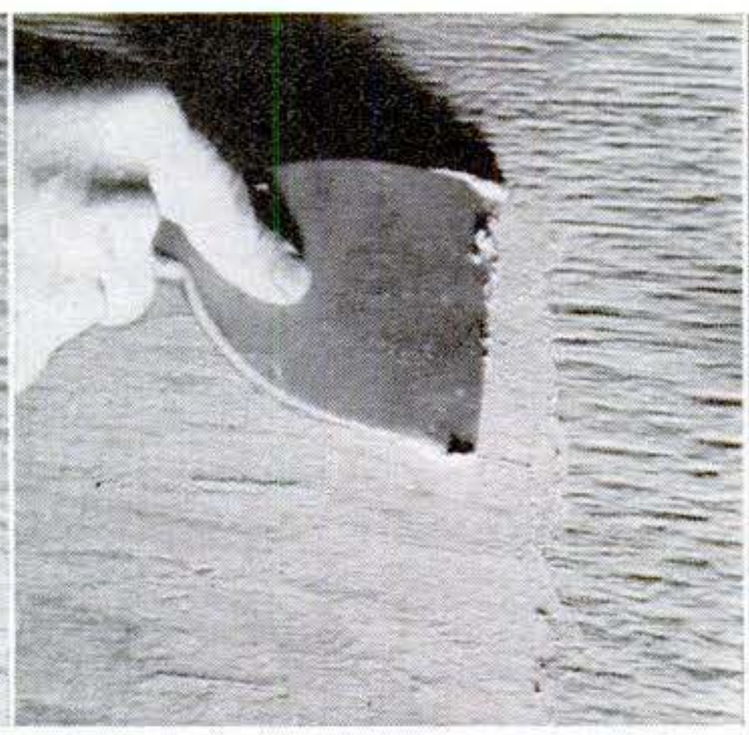
FOUR WAYS TO LICK THE ROUGH GRAIN OF CHEAP PLYWOOD

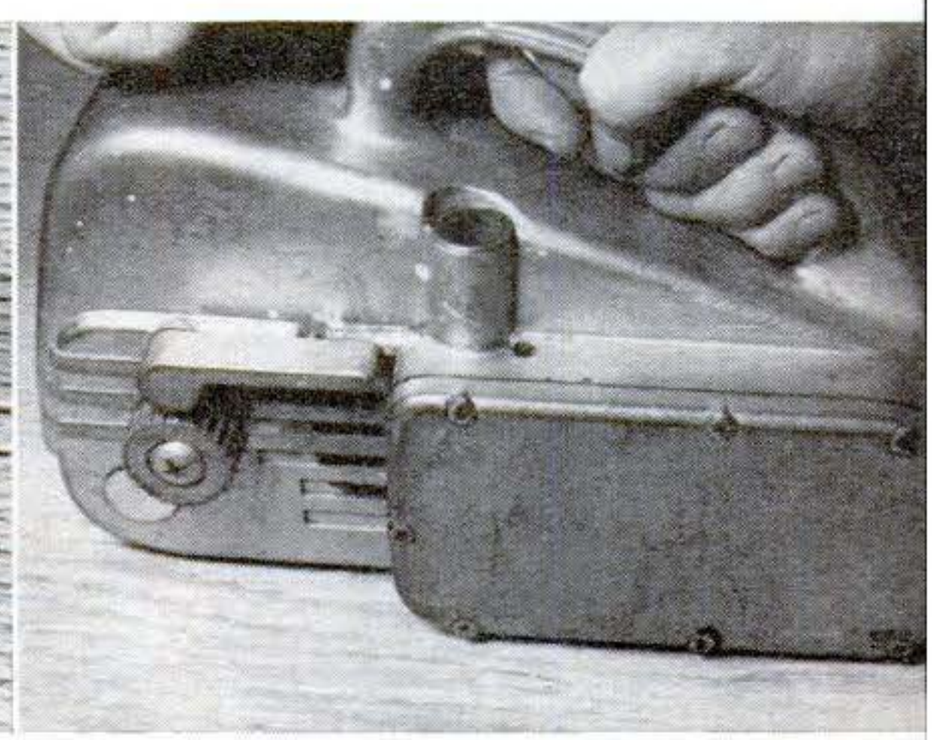


PLEASING FINISH is obtained on pieces without serious surface defects by just applying paint. Brush on two coats; sand lightly between.

WIRE-BRUSHING emphasizes the grain nicely, but is feasible only on small areas. Use a flexible cable or electric drill. Brush with grain.

LINOLEUM is a good covering for rough plywood used as a desk or counter top. Fill and sand big cracks before spreading linoleum paste.





WOOD-PUTTY type of filler will level off plywood surface and make a good paint job possible. First wet the wood thoroughly with a brush (left above). Make a thick mix of the filler and spread it with a wide putty knife (center). Smooth with power sander.

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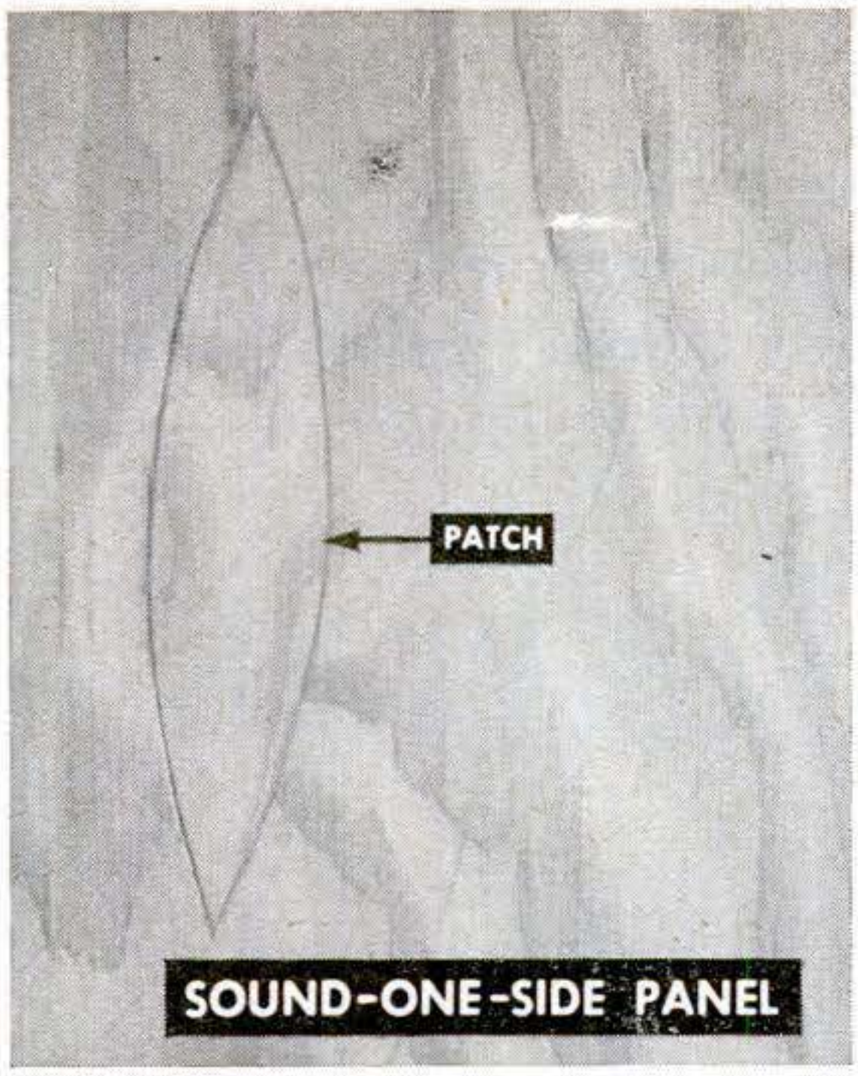
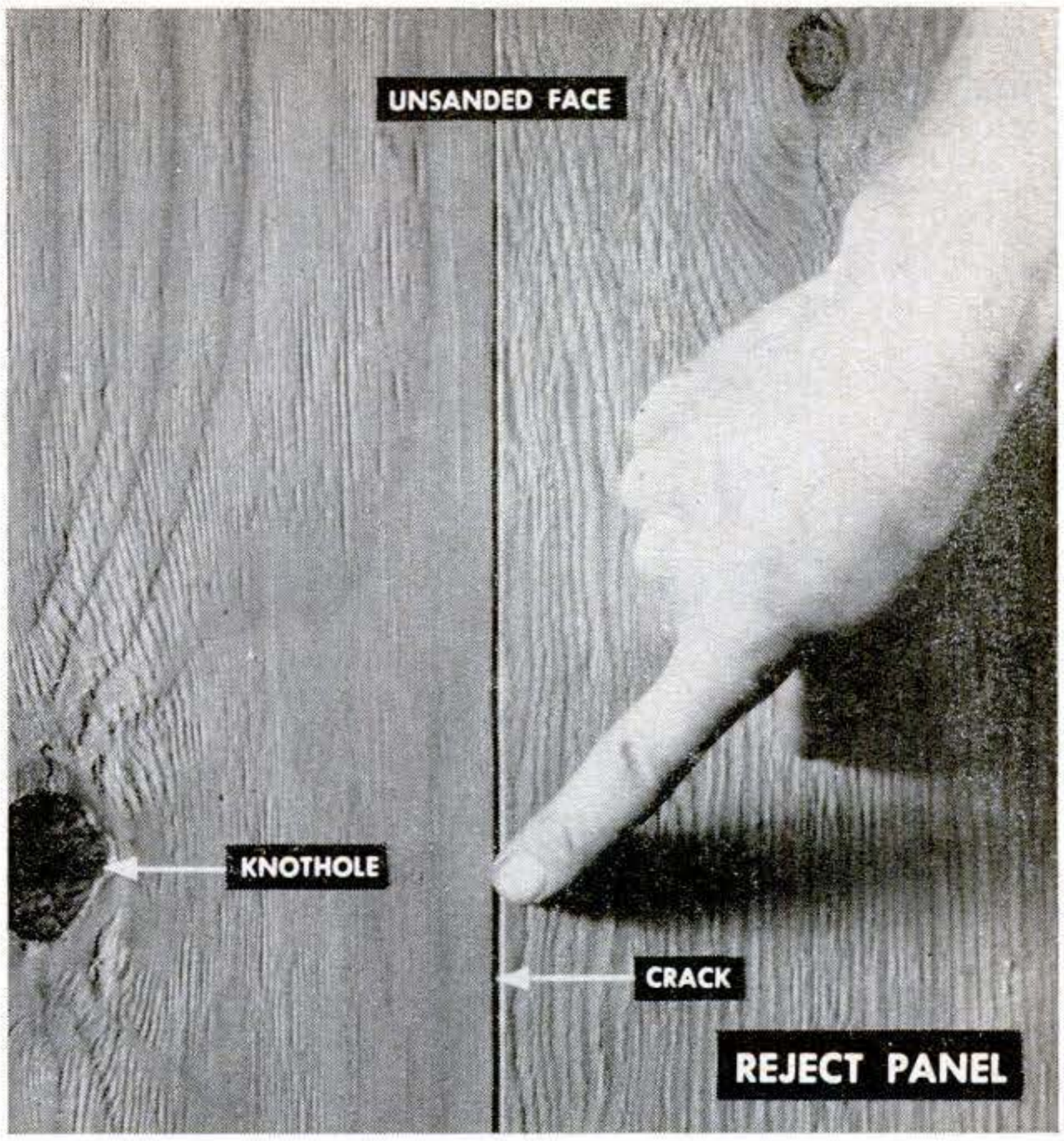
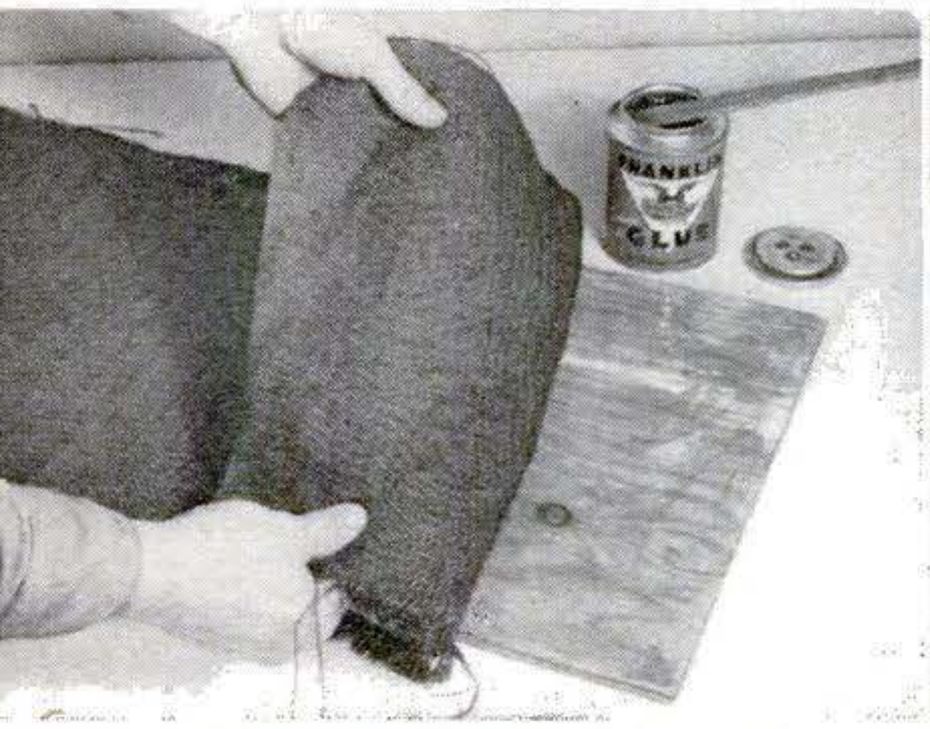
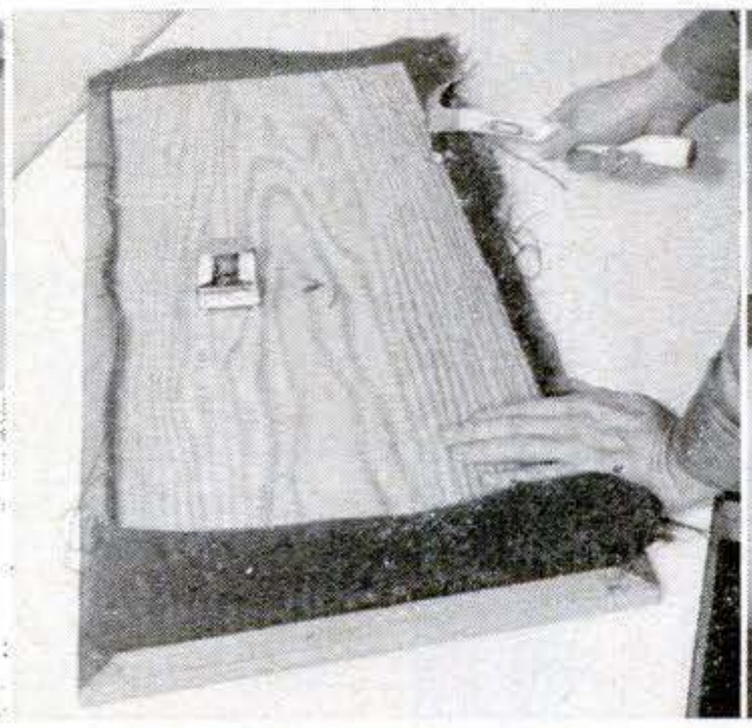


THE DIFFERENCE between a sound and a reject panel may be as great as that shown here. Note patch in sound face above. Defects at right are worst you'll find. For painting, they can be puttied or plastered.



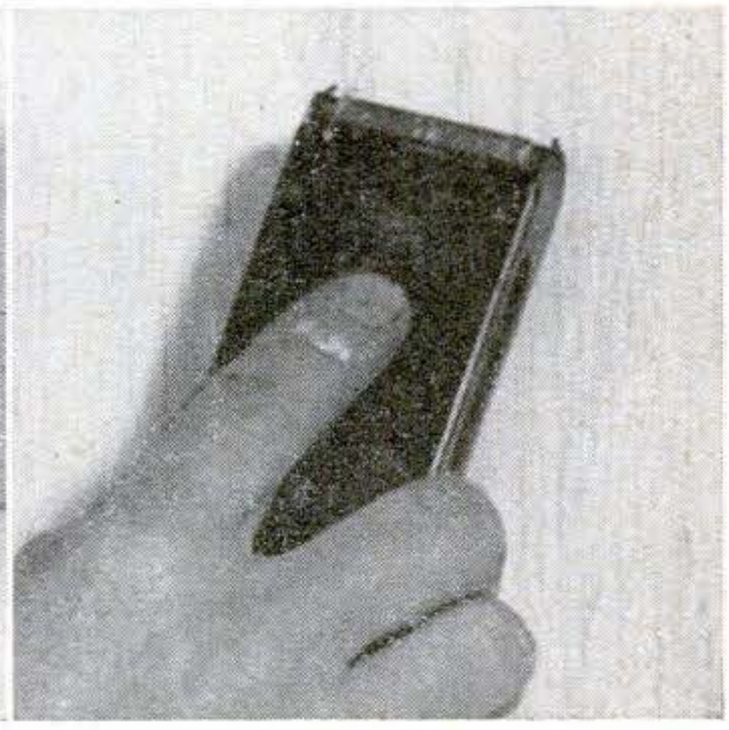


BURLAP FACING can transform cheap plywood into good-looking doors. Fill worst cracks; then spread glue evenly, apply burlap.



TURN OVER and drop burlap-covered panel into rabbeted frame as above. Be sure burlap is pulled smooth. Nail in place and trim excess cloth.

FINISHED DOOR is light, non-warping and attractive. Other cloths and patterned material might be used. Glue should be nonstaining kind.



PLASTER-BASE CRACK FILLER such as Spackle can be used to get a smooth painting surface. First give the panel a priming coat of paint (left). Smooth on the filler with a putty knife as evenly as possible (center). After it has set, sand the surface smooth.

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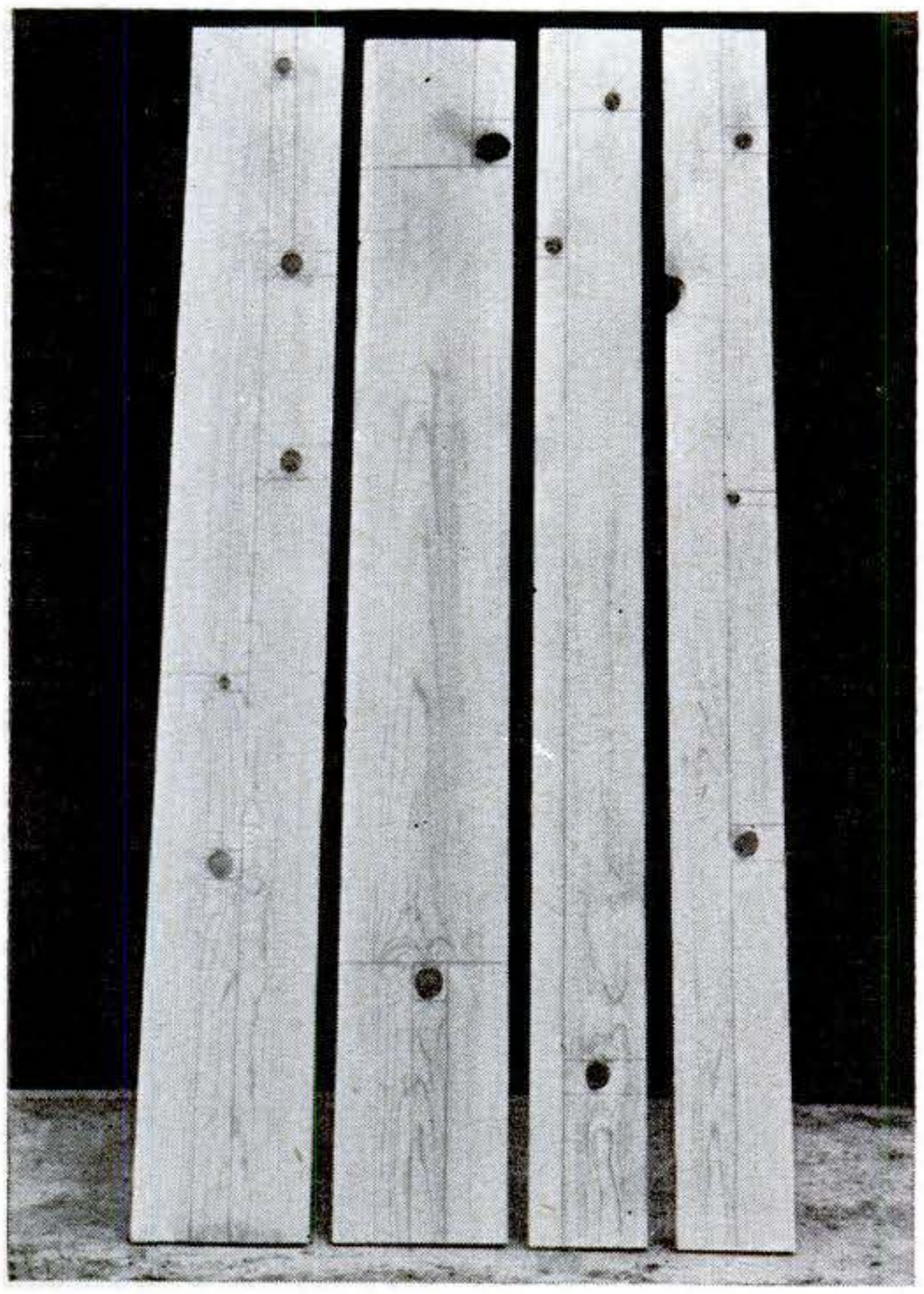
WOOD...

You don't always have to spend money on wood for small projects —and what you must pay for will be cheaper if you use shop grade.

Low-Cost Wood for Craftwork

APPLE-BOX WOOD was raw material for the projects directly above. Saw out the knots from shop-grade lumber (below) and the pieces left will be clear grade, at half price.



By D. Aller

WOODWORKING hobbyists waste thousands of dollars every year cutting up expensive lumber into little pieces. Nine times out of ten the fellow who turns bowls or lamps, carves plaques, or builds knick-knack shelves brings home clear stock of finish grade—the most expensive he can buy. Yet he could get wood just as good for his purpose at about half the price.

Ask for shop grade. The secret of saving money is to buy factory- and shop-grade lumber. If the nearest yard doesn't carry this, it will pay to find one that does.

Shop-grade lumber is none too pretty at first glance. It has plenty of knots, many of them along the edges, and some holes where loose knots fell out. Your first reaction may be to wonder how you can use it.

But this material is a gold mine to the craftsman, especially if he has a power saw. By cutting around the defects, he winds up with a lot of pieces just as good as the finish grades that cost so much when bought as boards. For many projects—lamps, book ends, corner shelves and candlesticks, only small pieces are needed.

Shop-grade lumber is a good bet, too, for

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the man who does weekend carpentering around the house. He will need more ingenuity to use the odd-sized pieces for shelves, racks, vegetable bins and so forth, but the saving makes it worthwhile.

Use those boxes. Don't overlook the lowly apple box and packing crate as wood sources. The ends are often ¾"-thick soft pine, which is suitable for many small projects. Crates are sometimes made of hardwood in the poorer grades, but between the splits and knots you may find short pieces of usable craft wood.

The thin sides of fruit boxes are ideal for such small items as birdhouses, spice shelves, spoon holders and other colonial reproductions.

When you want hardwood. You may find wonderful hardwood in your own or a neighbor's attic. Old pieces of furniture—bed headboards, chests, and especially old extension-table leaves—are good sources.

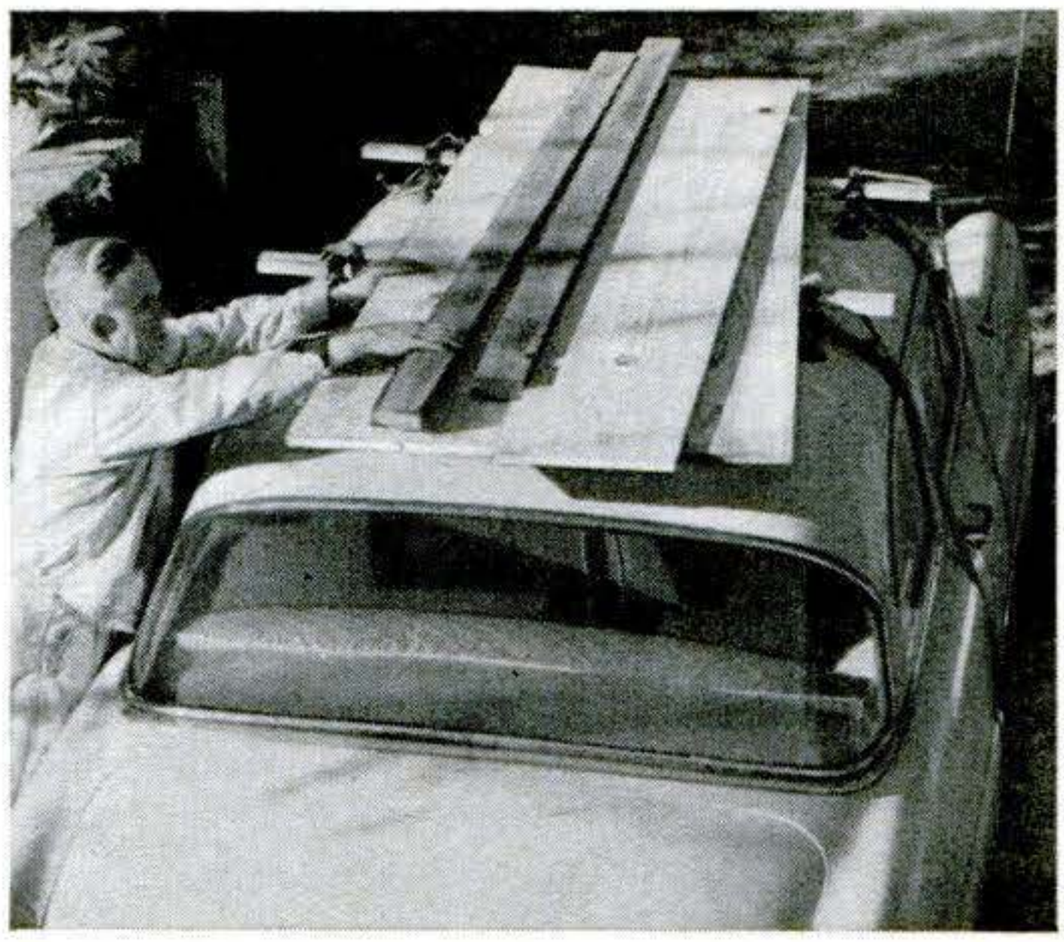
The only drawback to using such material is the old finish, which usually has to be removed. Don't make the mistake of trying to sand it off on your disk or belt sander—it will clog the abrasive cloth rapidly. Coarse, open-grained paper of the kind used on floor sanders is better. But the safest way to strip the wood is with paint remover and a scraper.

Try your yard, but . . . Scraps of new hardwood are sometimes obtainable as mill ends. Look for a lumberyard that does millwork. Sometimes you may need stock of less than standard thickness, which is hard to come by as a regular thing. The mill may have leftovers of ⅜" or ½" thickness from large milling orders.

But let's face it: the chances are that your local lumberyard will carry chiefly the softwoods commonly used for construction work. That means that if you're bound to use hardwoods you may have to forget about a low-cost job. The lumber dealer may be able to order any special hardwoods you want. Or you can order them yourself from one of the mail-order houses specializing in craft woods.

Among these wood specialists are Albert Constantine and Son, Inc., 797 East 135th St., New York 54; Craftsman Wood Service Co., 2727 S. Mary St., Chicago; and Frank Paxton Lumber Co., First and Kansas Ave., Kansas City 3, Kansas.

Wood from such sources will be perfect, every piece selected and usable to its full size. Naturally, it also costs more.



CASH AND CARRY will save you money at most lumberyards. A car-top carrier makes it easy to take your purchase home. Shopping in person also gives you your pick of the stacks.

MILL ENDS, manufacturing scraps, lumberyard shorts and even waste from building jobs can yield valuable material. This trailer load could keep a craftsman happy for months.

THERE'S GOOD WOOD in fruit crates and boxes. The rough sides can be sanded to yield 3/16" to 5/16" stock. To avoid splits, hammer against piece of wood as shown below.

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WOOD...

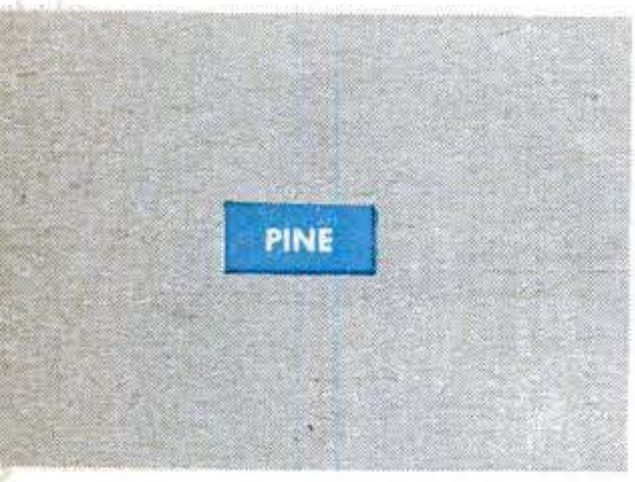
Even the experts can't pick them every time, but these clues will help you recognize the more common kinds.

How to Identify Woods

WHEN you order birch or maple from a craft-woods dealer, you get what you ask for. But there's a trick to it: the dealer keeps each kind in a separate stack. Once let them get mixed, and even the experts couldn't put them all back just right.

Nature never quite duplicates anything, and wood being a natural product, no two pieces are ever exactly alike. Although one may unmistakably be maple, you can look farther and find a piece of maple anybody might take for birch. Furthermore, there are varieties even within a kind—nine, for example, of white oak. So don't underrate yourself if you aren't sure which is which.

The photos below show typical examples of eight common woods, and the captions give clues to help you tell one from another. But grain, color and even hardness may vary widely. If you keep a mixed stack, the surest way to tell the kinds apart is to mark each piece the day you get it. END

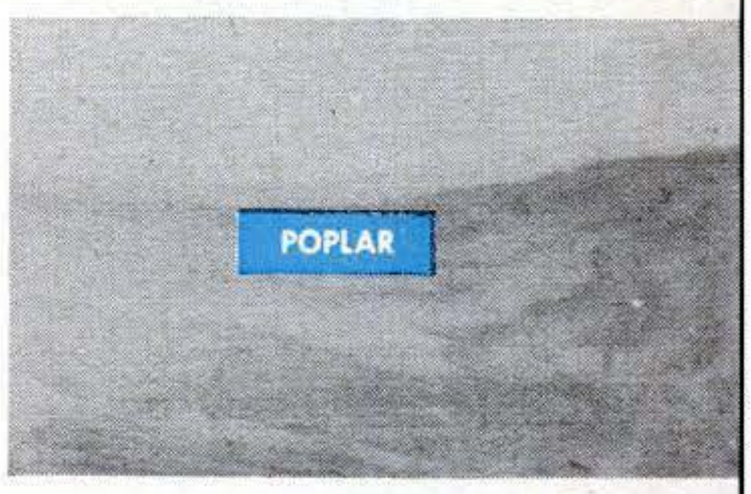


LIGHT in color and weight, most pines range from off-white to light tan, sometimes with an orange cast, and weigh less than 2½ lb. a board foot (kiln-dried). Southern yellow pine is definitely brownish yellow.

FAIRLY LIGHT in color, birch has a yellowish white sapwood with a reddish brown heartwood. It is a close-grained wood, hard and reasonably heavy, weighing approximately 3½ lb. per board foot when kiln-dried.

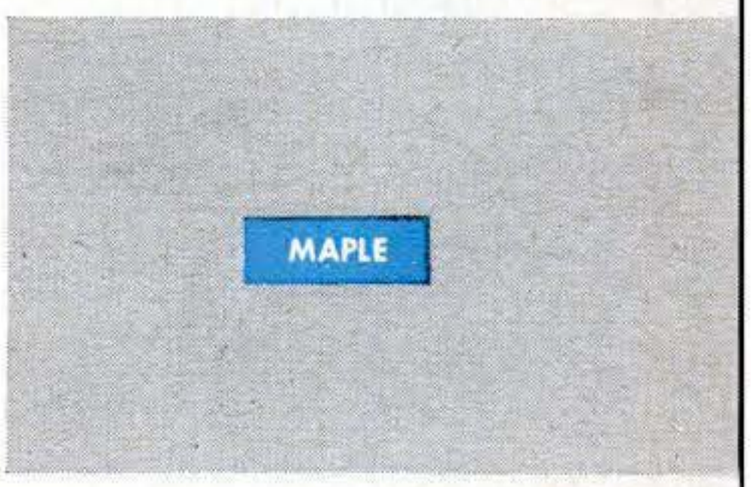
DON'T BE FOOLED by the color. Mahogany is a medium reddish brown, similar to finished cedar and much lighter than finished mahogany furniture. It has open pores, moderate hardness, and is fairly heavy.

POPLAR, often called whitewood, has the lightest color of the eight woods shown here. The sapwood is almost white, but the heartwood is pale olive to yellow brown. It is moderately soft and lightweight.



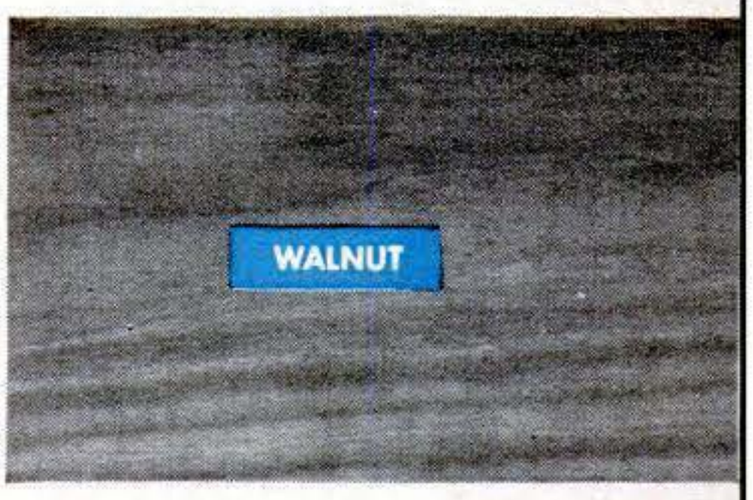
CHERRY FURNITURE is often deep red, but the wood is actually a light reddish brown—about as dark as white oak—with perhaps a green cast. It is close-grained, fairly hard and heavy. "Fruit wood" is usually cherry.

BETTER-GRADE MAPLE, called hard, lives up to its name—it is hard and heavy. The color is a light tan, lighter than pine but darker than poplar. It has very fine texture and grain, weighs about 3½ lb. per board foot.



THE OPEN GRAIN is the best tip-off to the oaks. White oak ranges from light tan to light brown in color; red oak is reddish or light reddish brown. Wood from the oak trees is extremely hard and heavy.

VERY DARK, walnut is a chocolate-brown color, often with a purplish cast. It has open pores and is moderately dense and hard. The texture is fine and even. The kiln-dried wood weighs about 3½ lb. per board foot.



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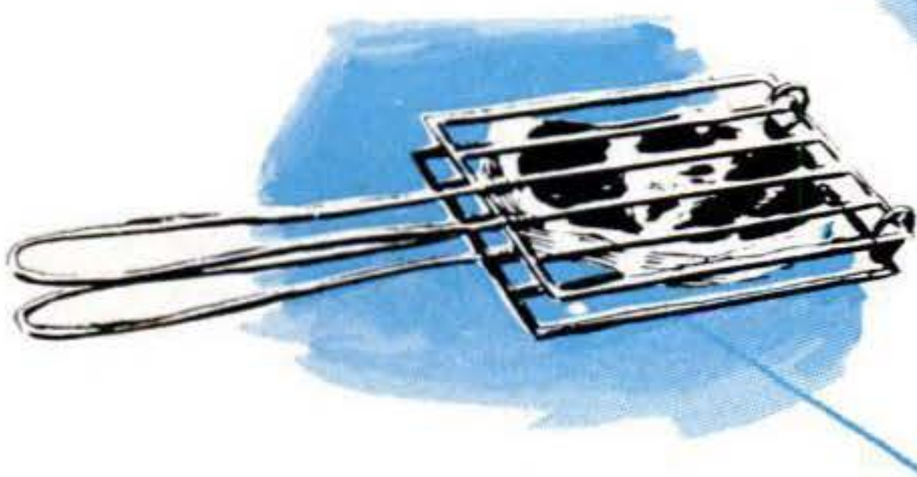
Oven shelf. Cut in half and fitted with a wire handle twisted around the frame, it becomes a broiler to hold a big T-bone steak over an open fire.

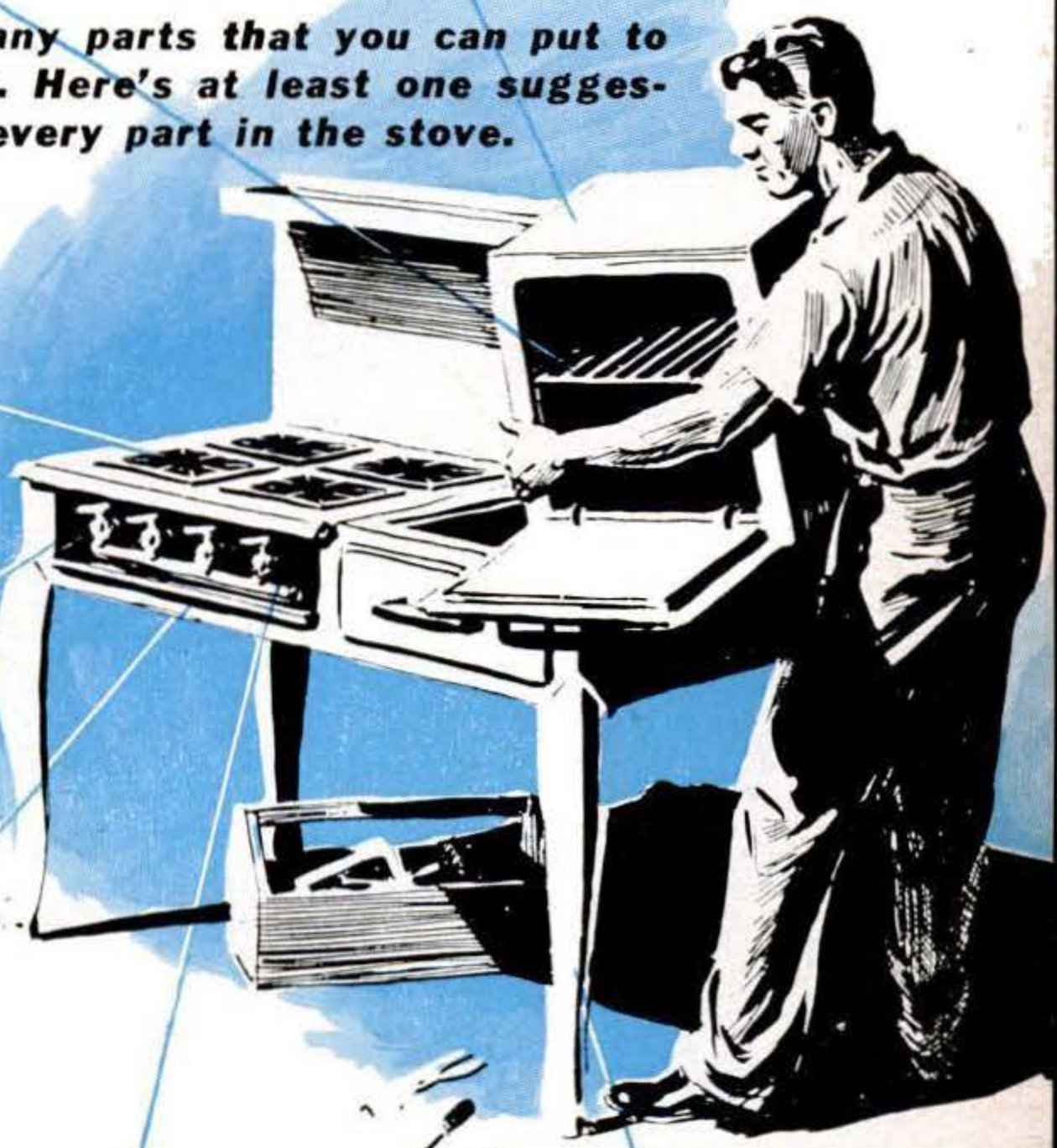


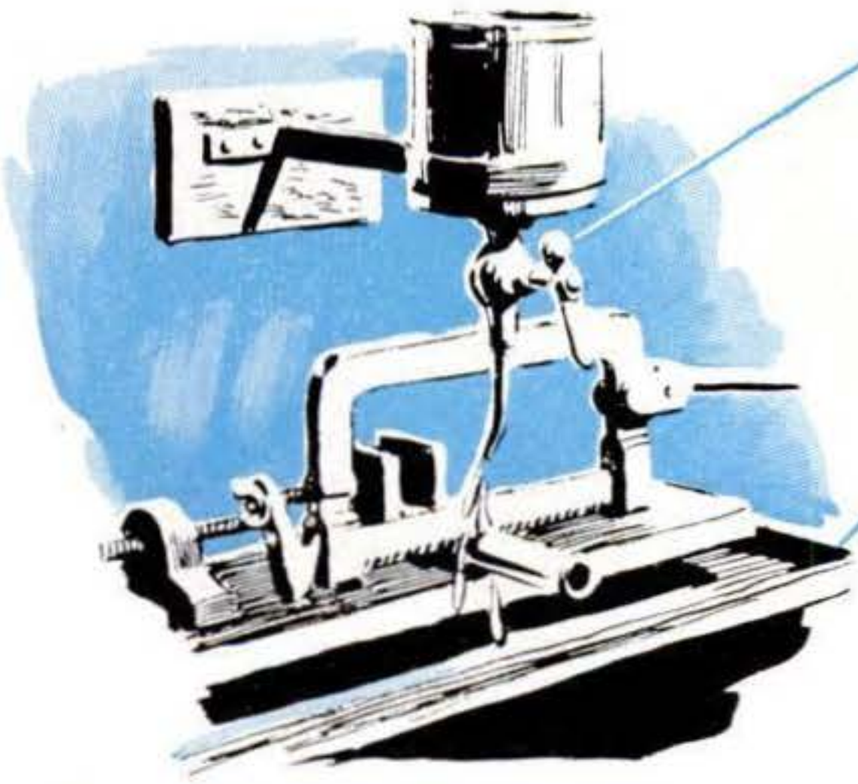
Sides and top. If unchipped they serve efficiently as ferrotype plates for drying photo prints. Otherwise, they are useful as a basement welding table.

Tear That Old Range to Pieces...

It has many parts that you can put to good use. Here's at least one suggestion for every part in the stove.

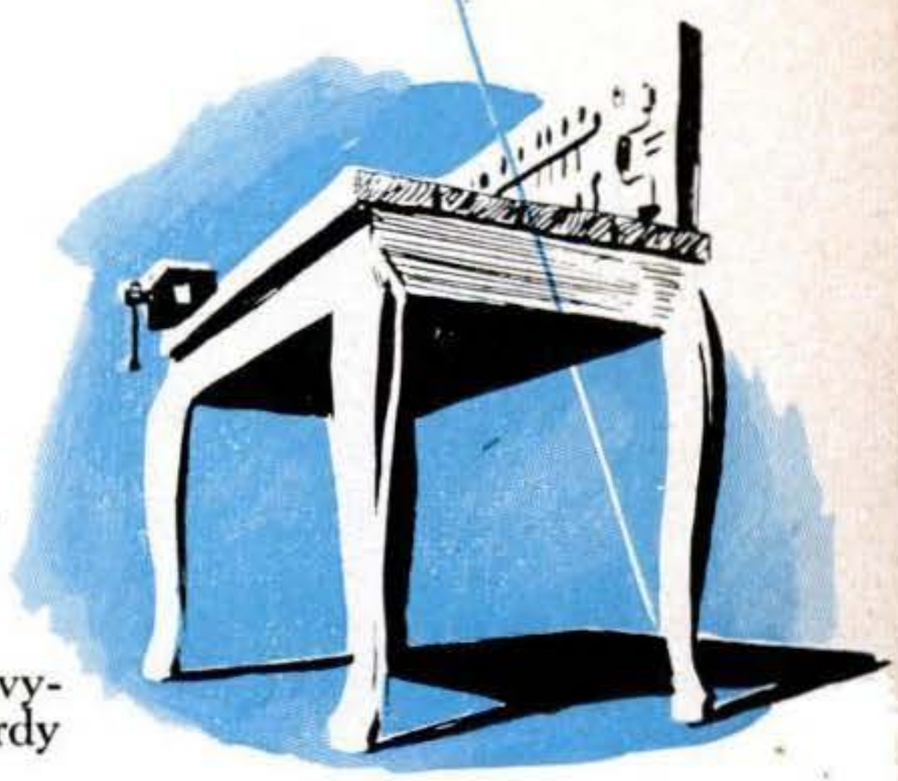
Grill. Set up on stones, it supports the coffee 'n beans for that outdoor barbecue.





Gas cocks and burner tray. Gas cocks make valves for your compressed-air outfit or for dribbling coolant on power tools. Set the tray under the tools to catch chips and drippings.

Burners. Several of them fitted to lengths of garden hose will sprinkle a wide area of lawn.



Legs. They're made of heavy-gauge steel and make sturdy legs for a workbench.

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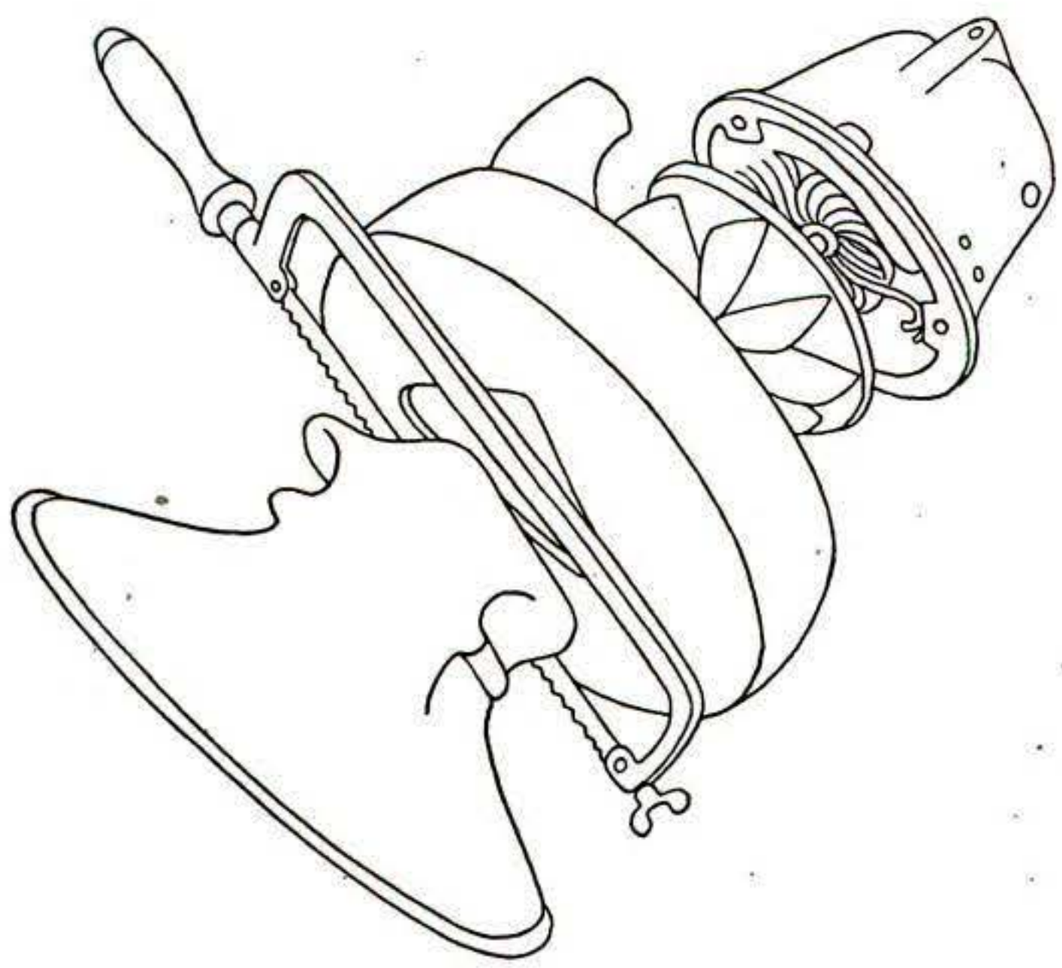
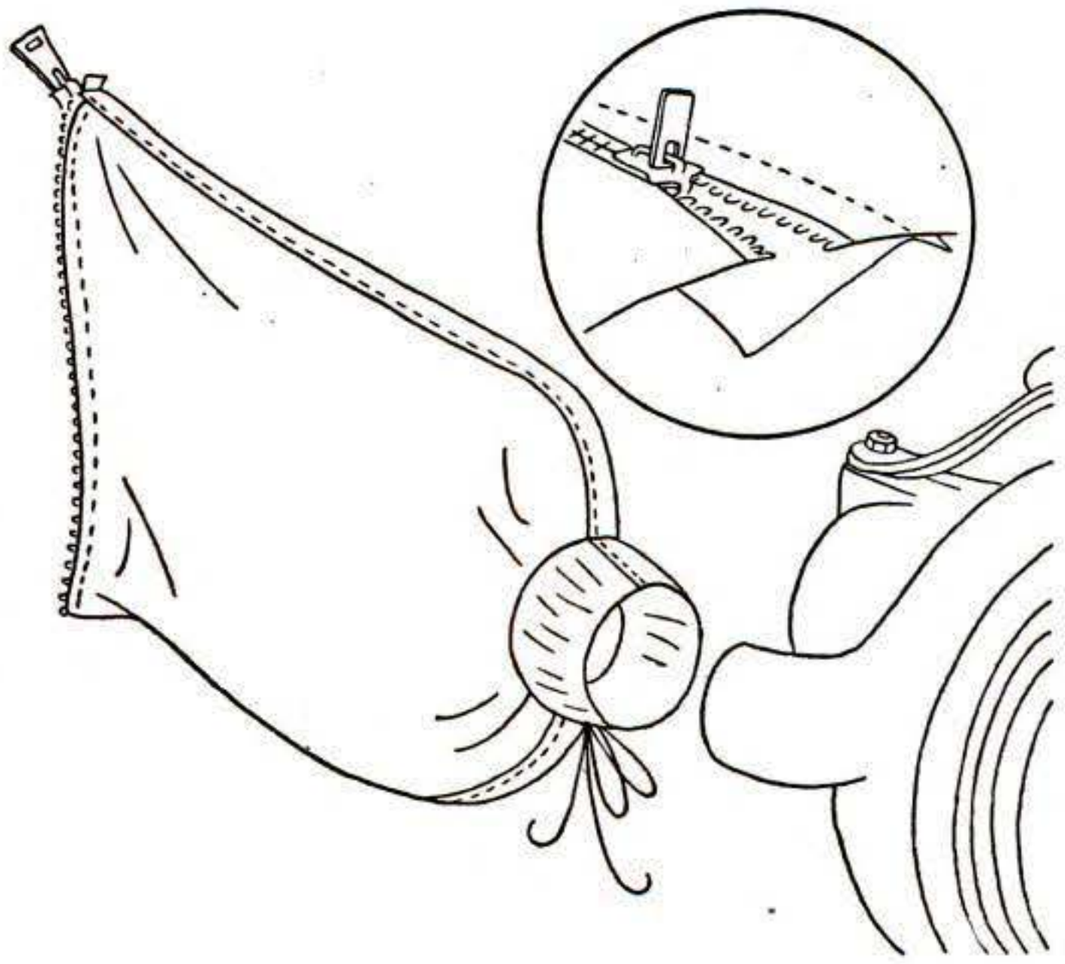
Wordless Workshop





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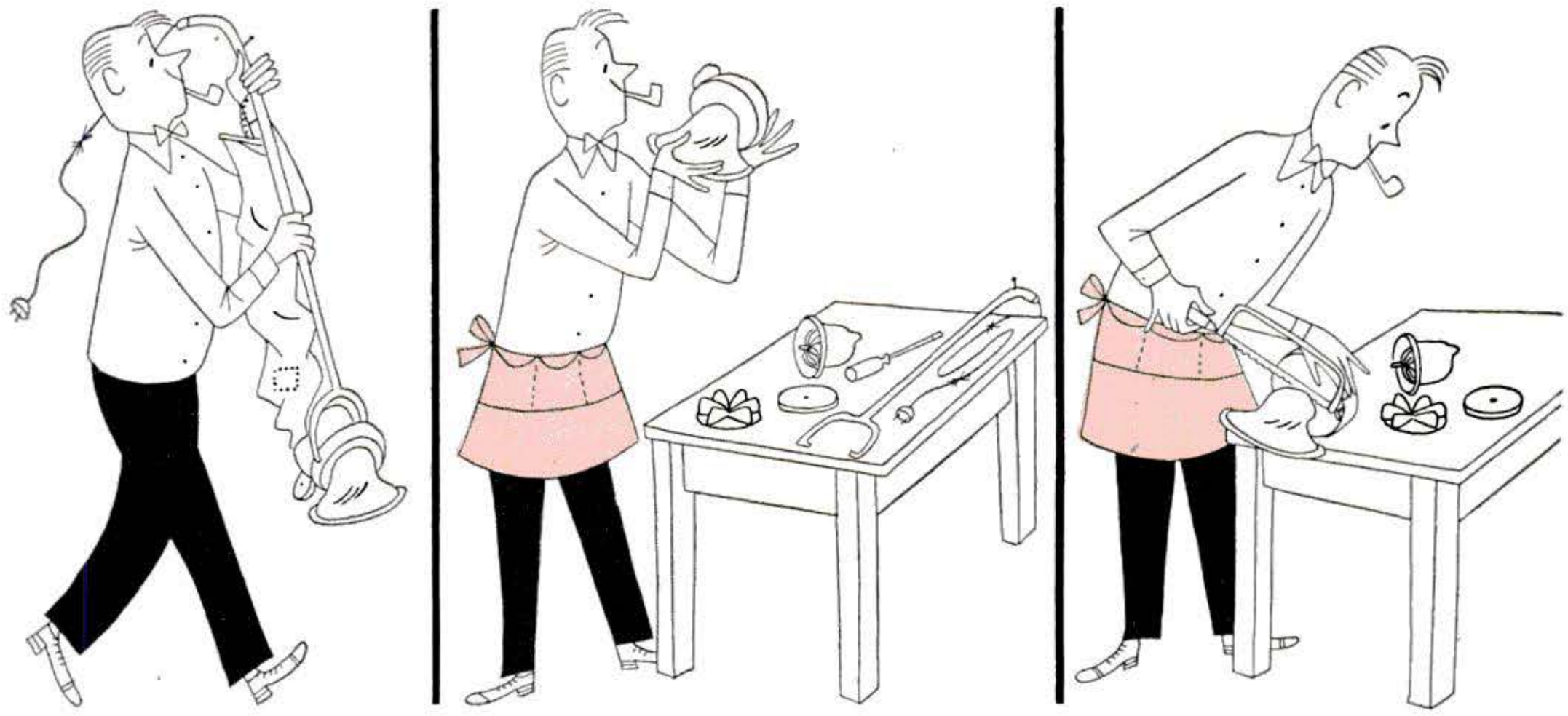

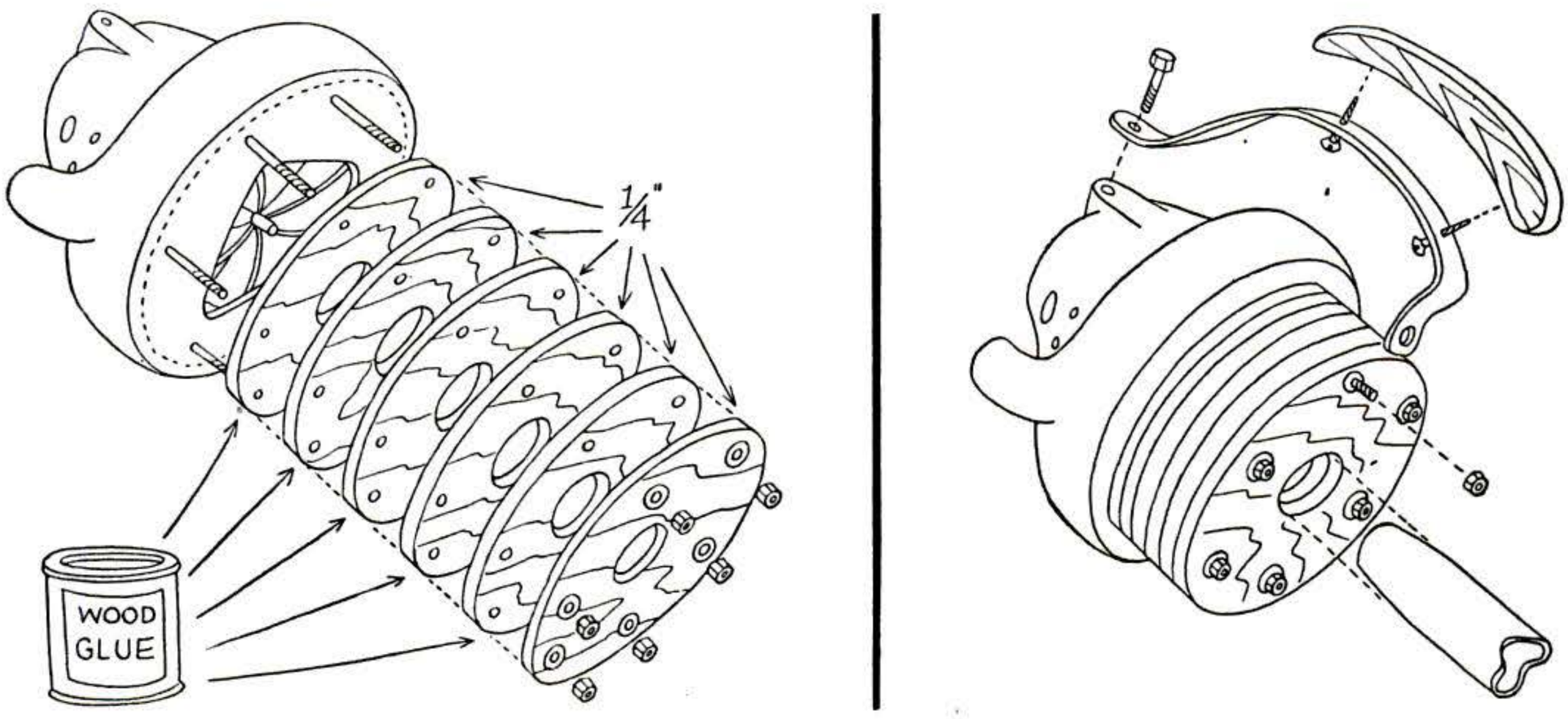

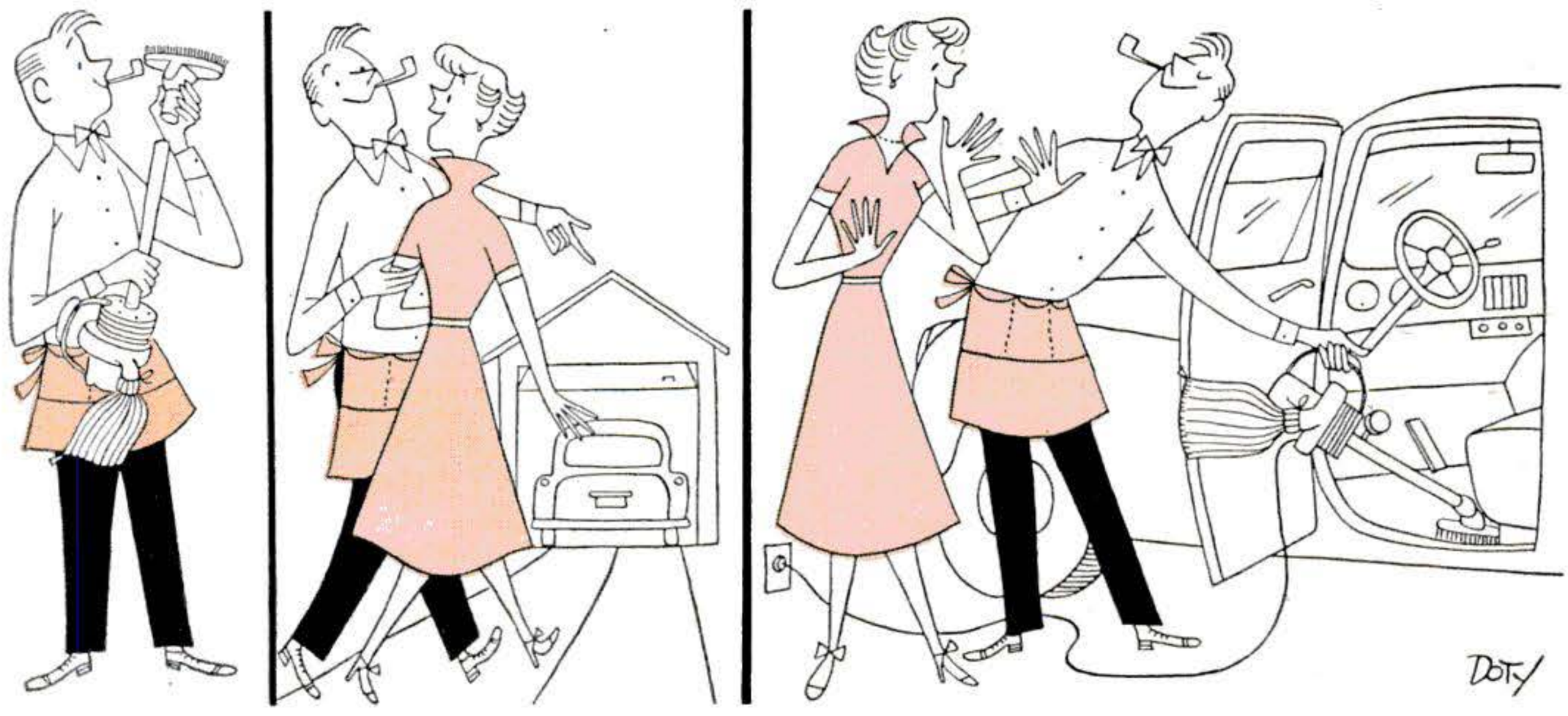

See PSM next month for another Wordless Workshop.

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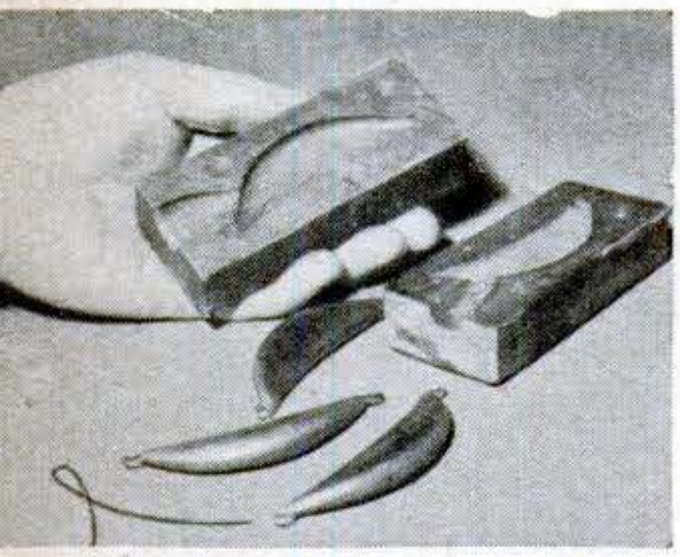
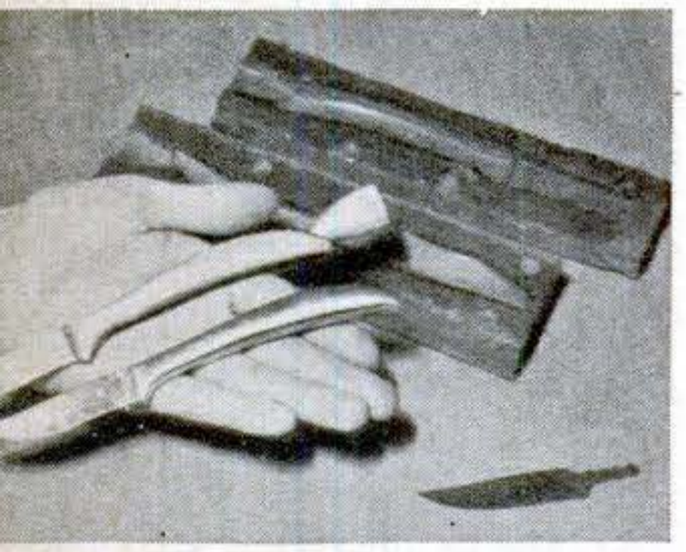
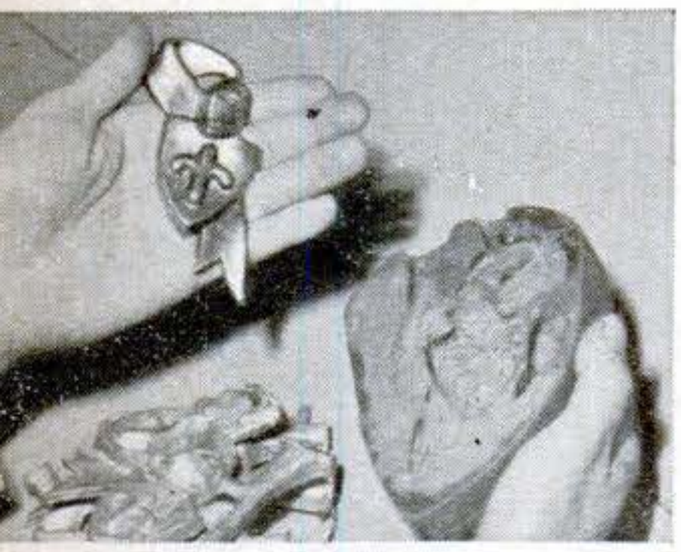
MODEL PARTS such as boat propellers or toy wheels can be cast in home foundry.



FISHING SINKERS. Eyes bent from brass wire are placed in mold before pouring lead.



STEAK KNIVES. Handles are cast around stainless-steel blanks. Blank is at right.



EMBLEMS. Fraternal crests, name plates or trophy decorations are good casting subjects.

JEWELRY by the handful can be cast of solid silver, and then buffed sparkling bright.

LEAD SOLDIER (left below) was cast in metallic-cement mold using plastic figure (right) as pattern. Note accurate detail, smooth finish. Mold is not destroyed by casting, can be used again.

Iron-Paste Molds Make Casting Easy

Using this method, you can turn out small metal objects with production-line speed.

By John Burroughs

INTRICATE, odd-shaped parts that you can't build up from stock metal can be cast in tough molds made of ordinary powdered-iron cement. Using the cement instead of the old sand method gives you a strong, durable mold that will last through dozens of castings. It produces a clean, smooth surface that's finer than many foundry sands, saving hours of finishing.

You can buy the metallic cement at any hardware store. Mixed with water to make a heavy, slow-flowing paste, it is simply poured over patterns that are flat on one side and allowed to set. Patterns with details on both sides require a mold made in two sections so that you can get the finished casting out. One half of the pattern is embedded in modeling clay while the first half of the mold is made. Only other materials you'll need are some petroleum jelly for greasing the mold, a crucible and suitable source of heat for melting the metal and a supply of scraps to melt down. The pattern can be almost anything made of wood, metal, plastic or wax. Even a soap carving will do if it's waterproofed with a coat of shellac.

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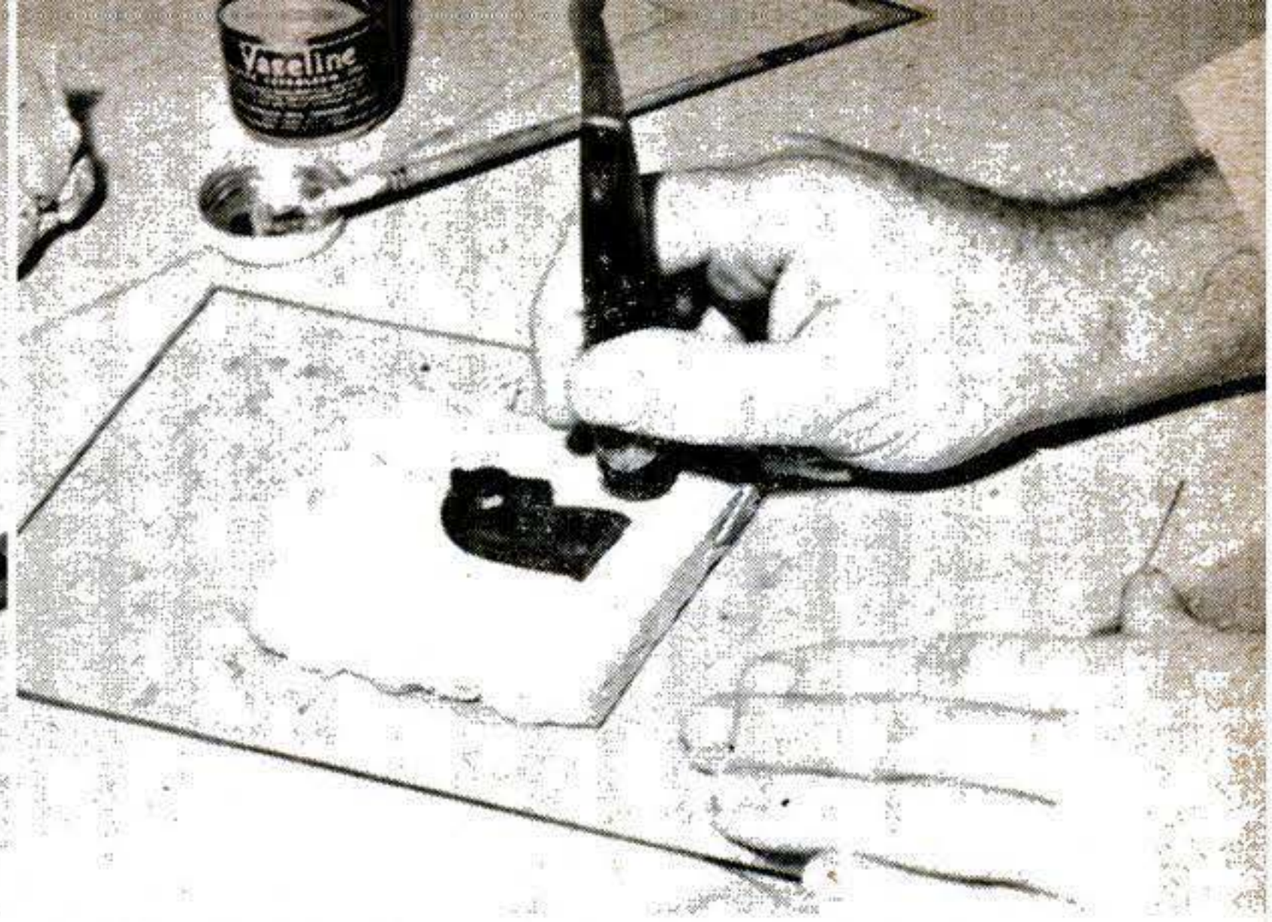
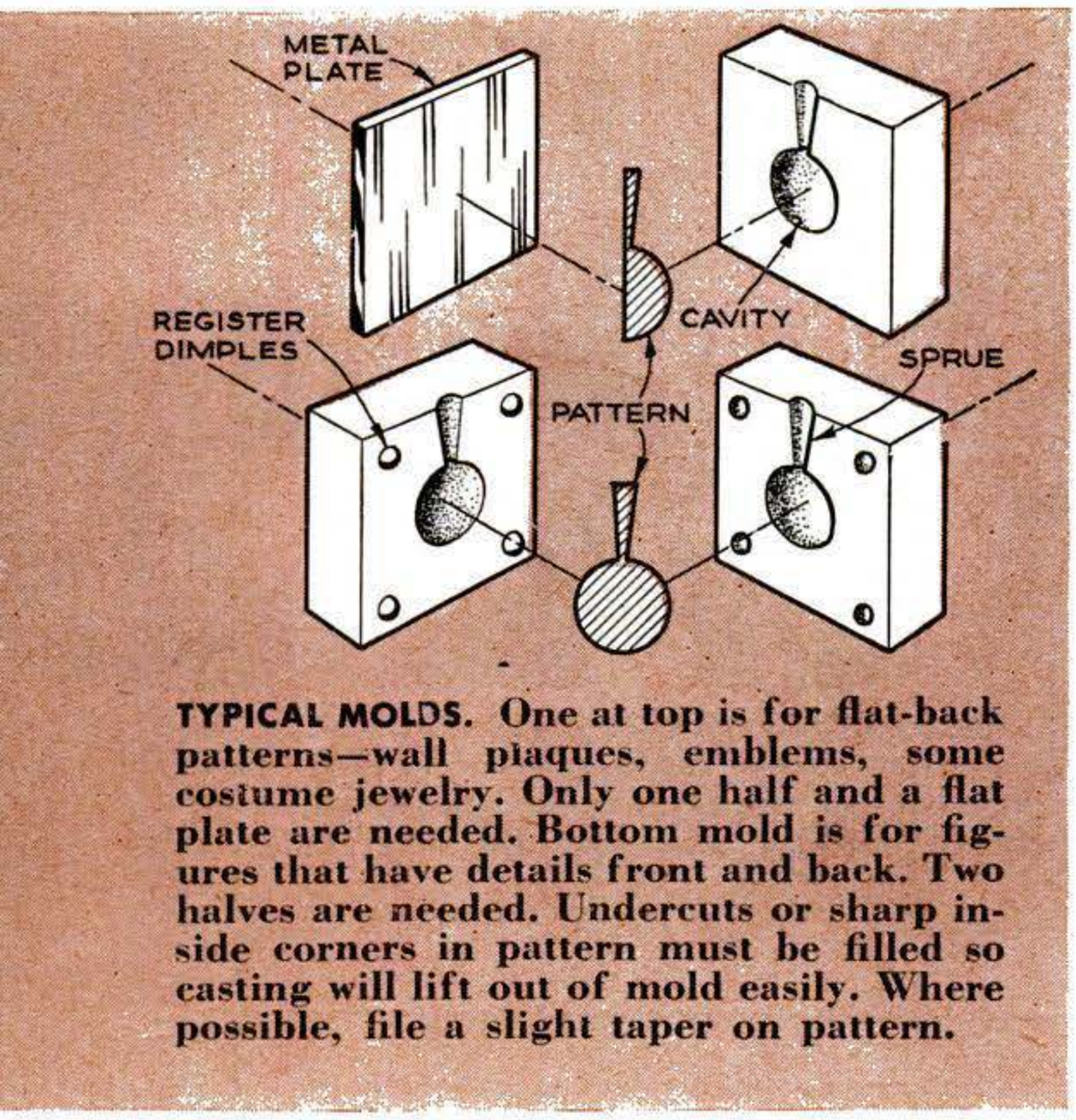
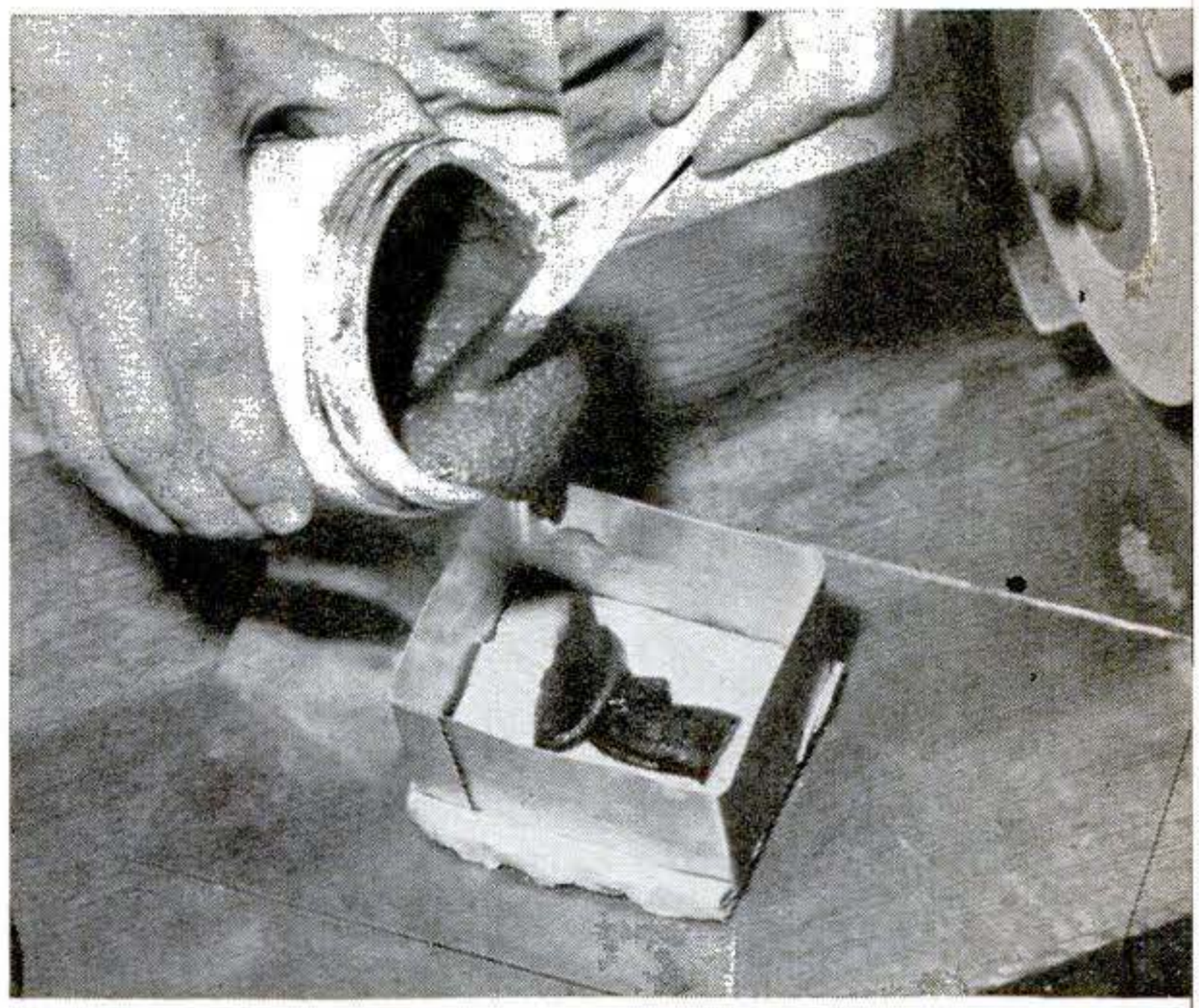
1 THE PATTERN MAKES THE MOLD. Here chess figure is divided with pencil line into two halves for easy removal from mold. This is called the parting line.



2 PRESS PATTERN in modeling clay up to parting line for first half. Press register dimples in corners and build up clay pattern for the sprue (built-in pouring spout).



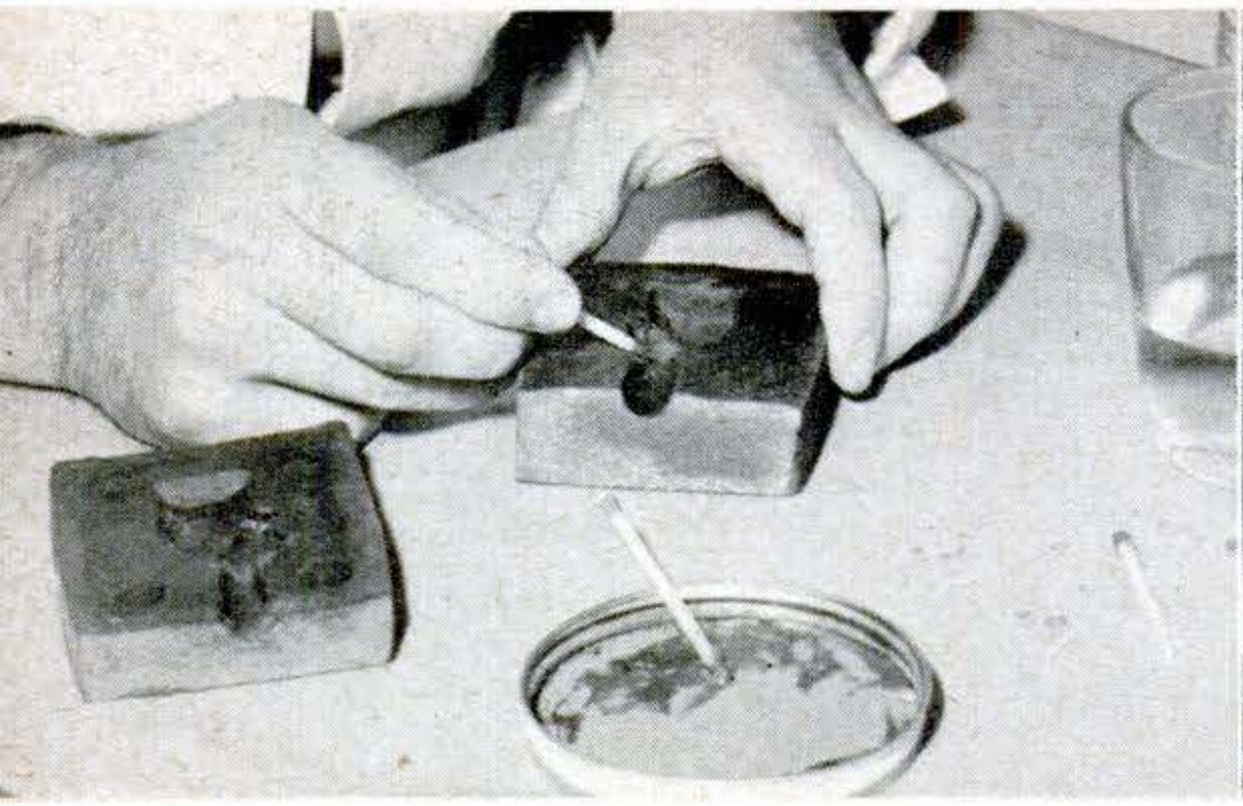
TYPICAL MOLDS. One at top is for flat-back patterns—wall plaques, emblems, some costume jewelry. Only one half and a flat plate are needed. Bottom mold is for figures that have details front and back. Two halves are needed. Undercuts or sharp inside corners in pattern must be filled so casting will lift out of mold easily. Where possible, file a slight taper on pattern.



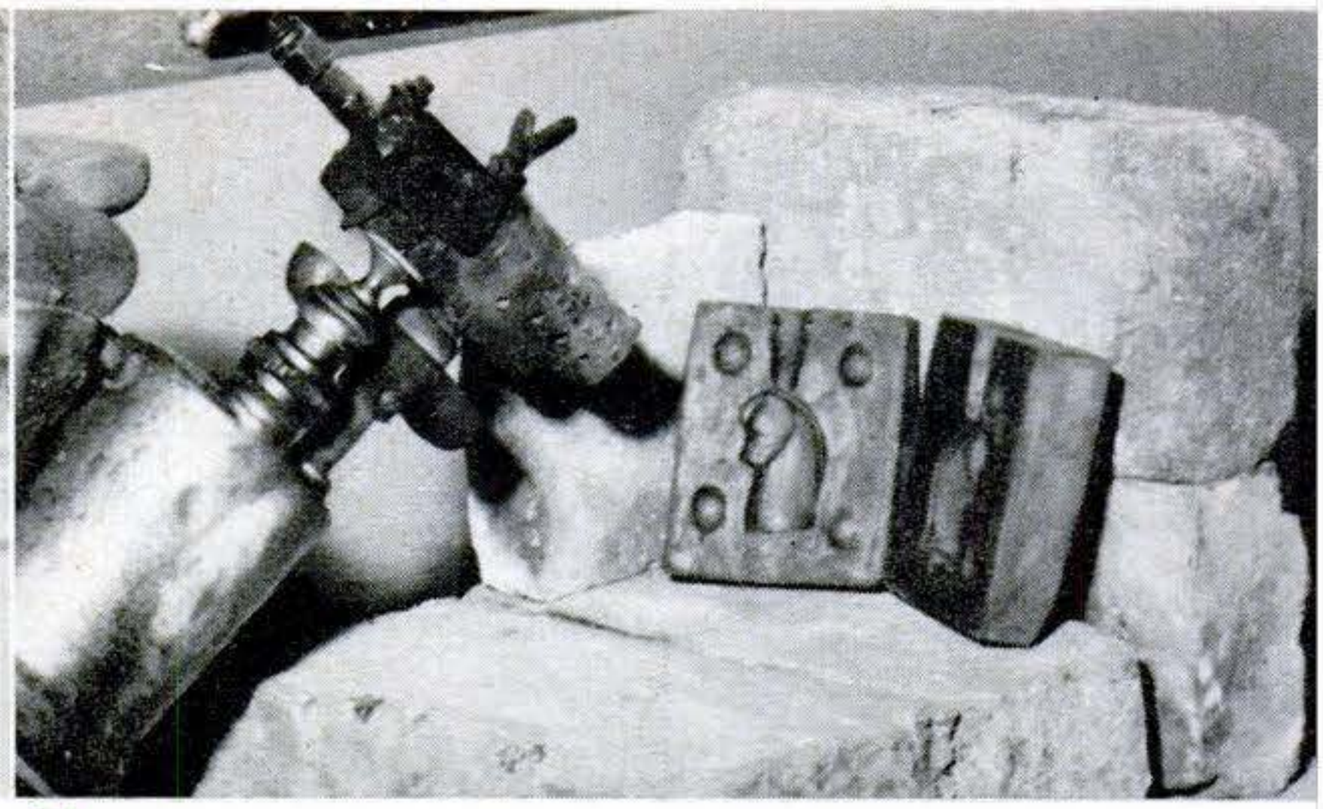
3 POUR MIXED IRON CEMENT over pattern in clay after greasing it and framing it with sheet metal. Pour beside a running power tool or tap bench to vibrate mix and settle it around pattern. This completes half of mold.

4 SCRAPE OFF CLAY when mix dries and check pattern for easy removal from mold. Put pattern back in mold, grease entire surface and pour second half of mold against the first.

5 SEPARATE THE TWO HALVES with knife blade at parting line and lift out pattern. Register dimples in first half form matching projections in second half. *(Please turn page.)*

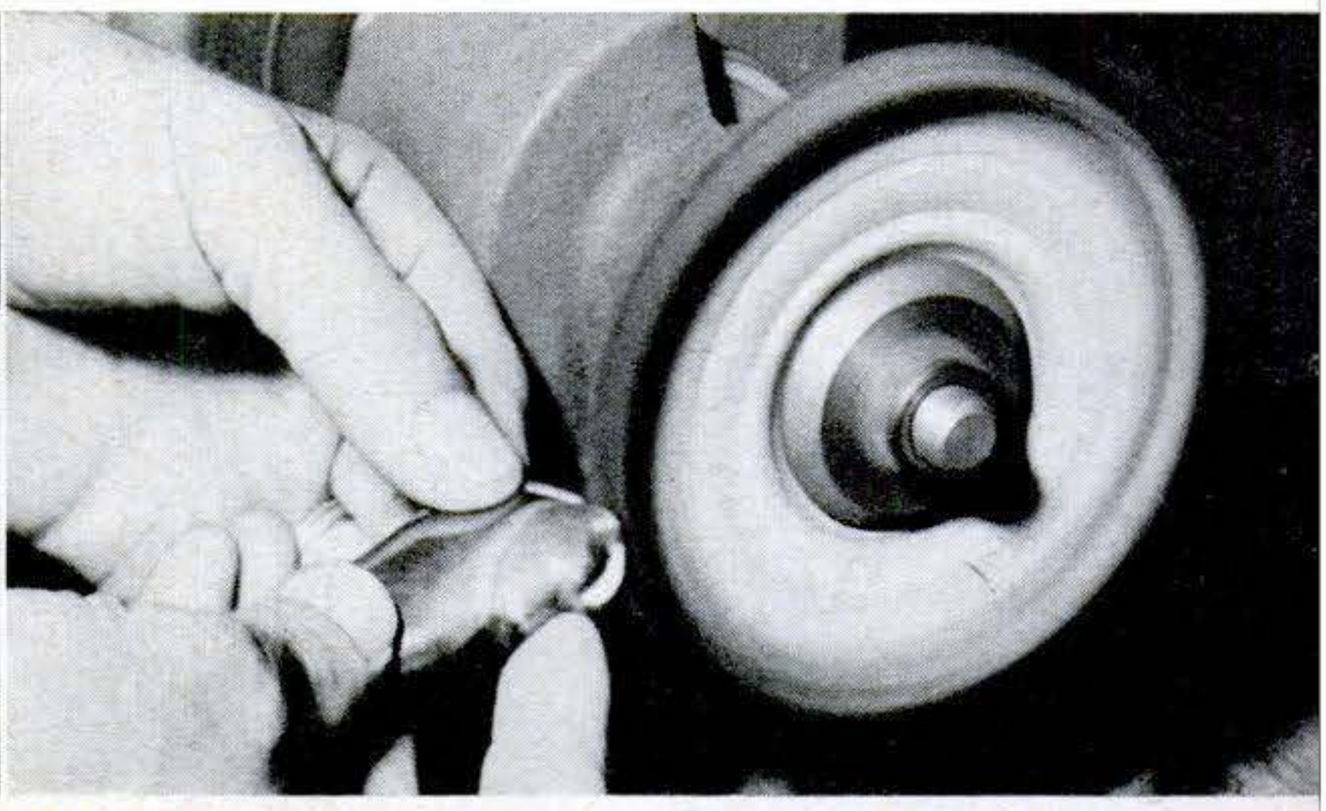


6 PATCH IMPERFECTIONS or bubble holes, if any, with a thick mixture of iron cement and set the mold aside for several days to harden and thoroughly dry out.



7 PREHEAT MOLD to drive out last trace of moisture and keep metal from chilling too fast. Slightest dampness will cause metal to splatter, so keep your distance when pouring.

8 CLAMP GREASED HALVES TOGETHER and heat casting metal in crucible. Sprinkle molten metal with welding flux or borax and pour into mold until it is filled to top. Let it cool.



9 FINISHED PRODUCT OF HOME FOUNDRY. Unclamp and pry mold apart to remove casting. Clip off sprue, remove flash and buff bright. Sanding disk smooths flat surfaces.

CASTING

Metal	Melting Point	Heat Source	Action on Cooling	Sources of Material
Tin	450°F.	Gas stove	Shrinks slightly	Refrigerator coils, beer-tap tubing
Lead	621°F.	Gas stove	Shrinks	Plumber's lead, scrap sheeting, drainpipe
Type metal (lead and antimony)	650°F.	Gas stove	Expands slightly	Printer's linotype slugs, stereo plates
Zinc alloy (zinc and aluminum)	850°F.	House furnace or firebrick furnace	Expands slightly	Scrap die castings, auto fuel pumps, grilles
Magnesium	1,200°F.	Furnace	Shrinks slightly	Pig
Aluminum	1,216°F.	Furnace	Shrinks	Scrap sheet, auto pistons, cylinder heads
Silver	1,760°F.	Acetylene torch	Shrinks	Jeweler's supply house
Brass (copper and zinc)	1,900°F.	Acetylene torch	Shrinks	Lathe turnings, rod ends, pig

FOR YOUR *POPULAR SCIENCE MONTHLY* INFORMATION FILE

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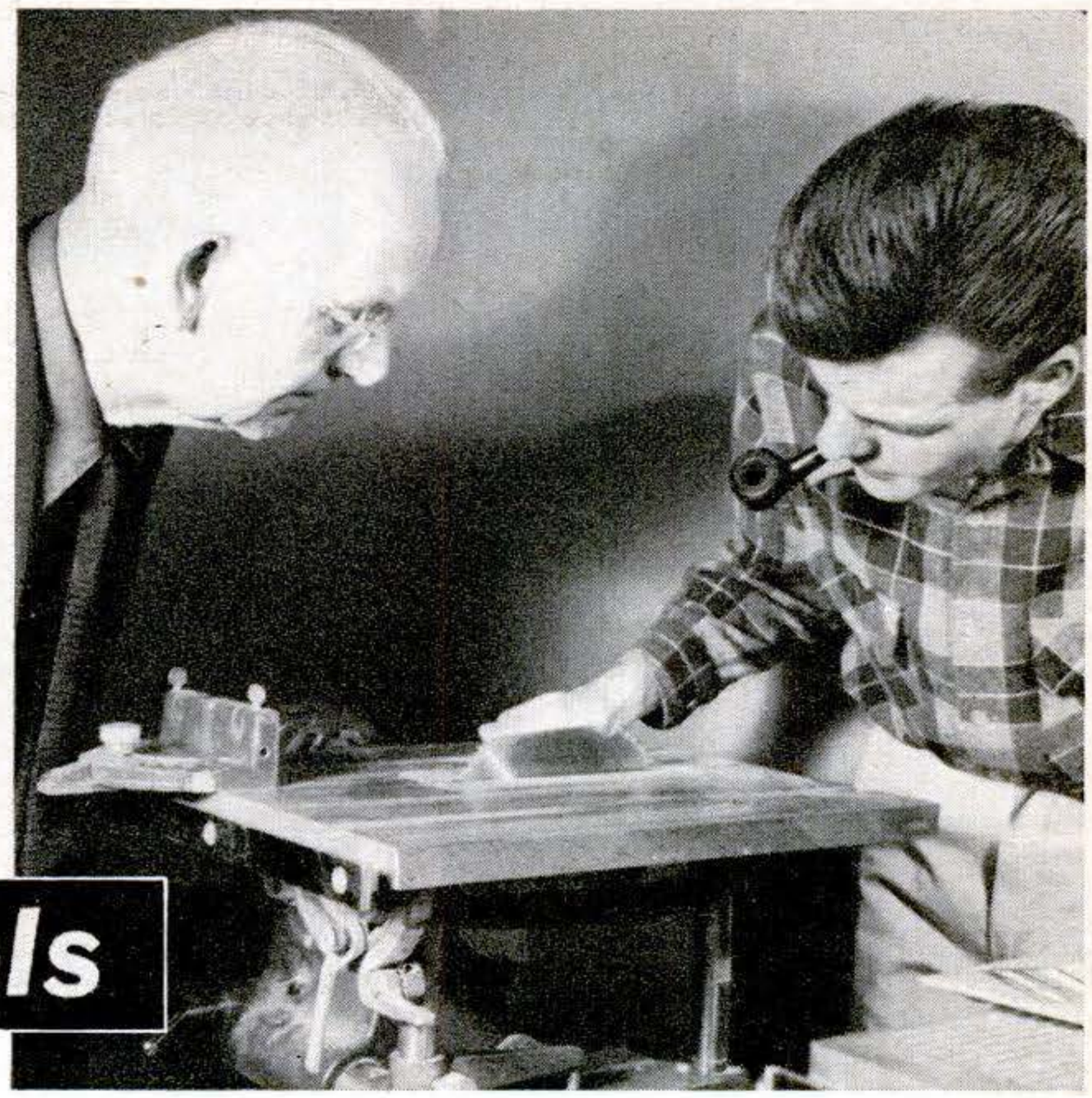
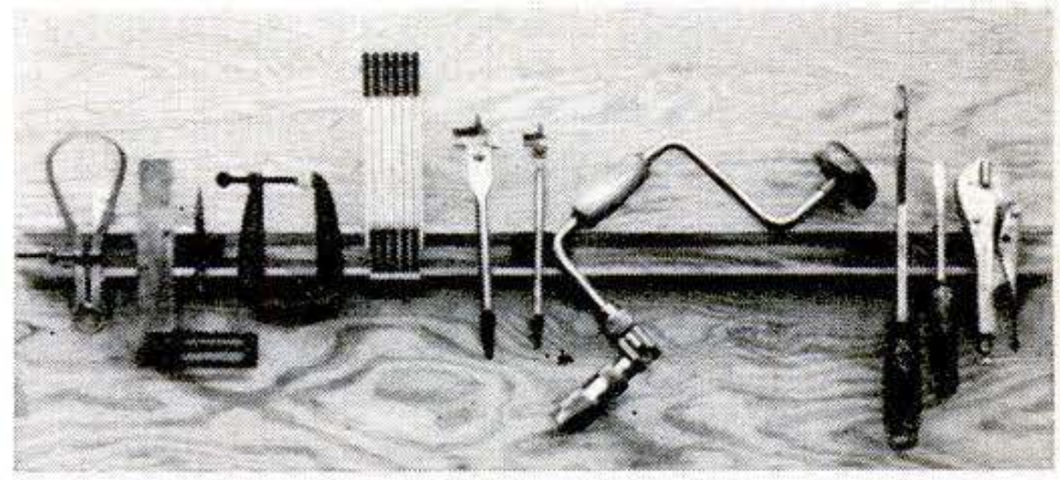


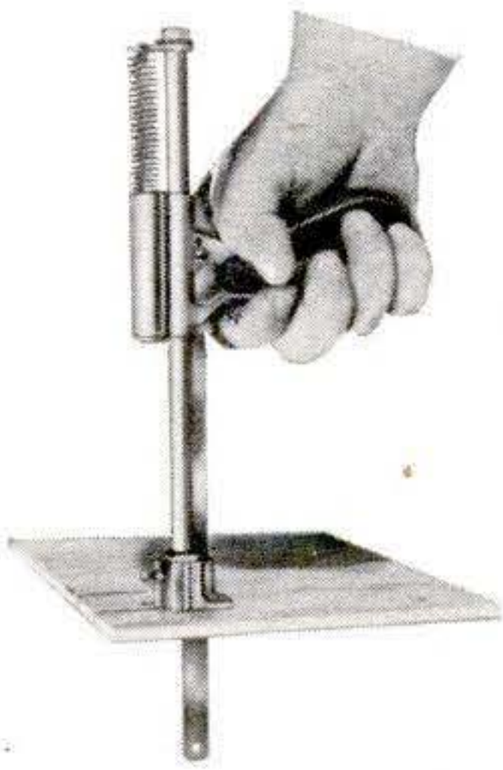
New Tools

1. Square Blade Cuts Faster. This square blade for circular saws is said to cut faster with less friction because of the smaller blade area in contact with the wood. Requiring less power, it will do heavy cutting normally beyond a saw's capacity. The blade will rip or crosscut and comes in sizes from 5⅞″ to 16″.

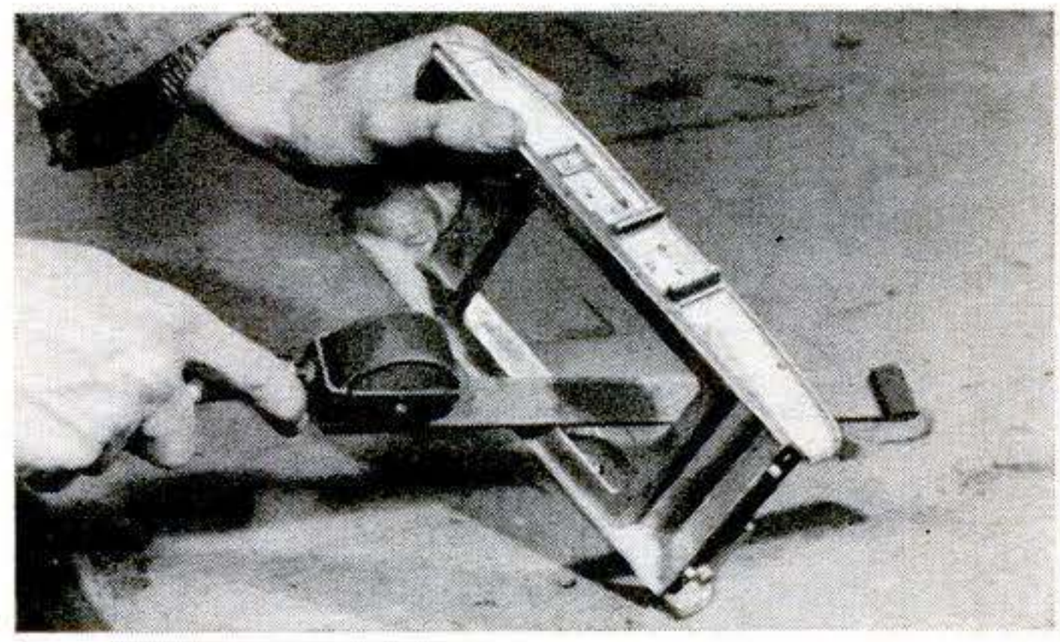
2. Magnets Hold Heavy Tools. Large hand tools are easily held by this heavy-duty magnetic rack. The rack consists of two long permanent bar magnets, with the poles arranged on the sides instead of ends so that their holding power is distributed throughout their entire length. Two sizes are available, 24″ and 36″ long.



3. Hacksaw Cuts Anywhere. Because there's no frame to get in the way, you can make cuts of any length or contour with this new hacksaw. The blade slides in a grooved guide that rests against the work. After each forward stroke, the spring-held pistol grip draws the blade back, doing half the work for you. The saw will take any standard hacksaw or keyhole blade.



Further information on these products can be obtained from: 1. Clark & Sawyer, Inc., 600 Mateo St., Los Angeles; 2. Miami Magnet Co., 3240 N.W. 27th Ave., Miami; 3. American Mercantile Co., 33 W. 42nd St., NYC; 4. Minnesota Mining and Mfg. Co., St. Paul.



4. File Dispenses Own Abrasive. As you wear down this file, you simply pull out a new length of abrasive cloth from the roll in the handle. This eliminates the clogging, cleaning and dulling of ordinary files and permits one tool to use a wide range of grit sizes. Each roll holds 6′ and comes in grits from 24 to 320.

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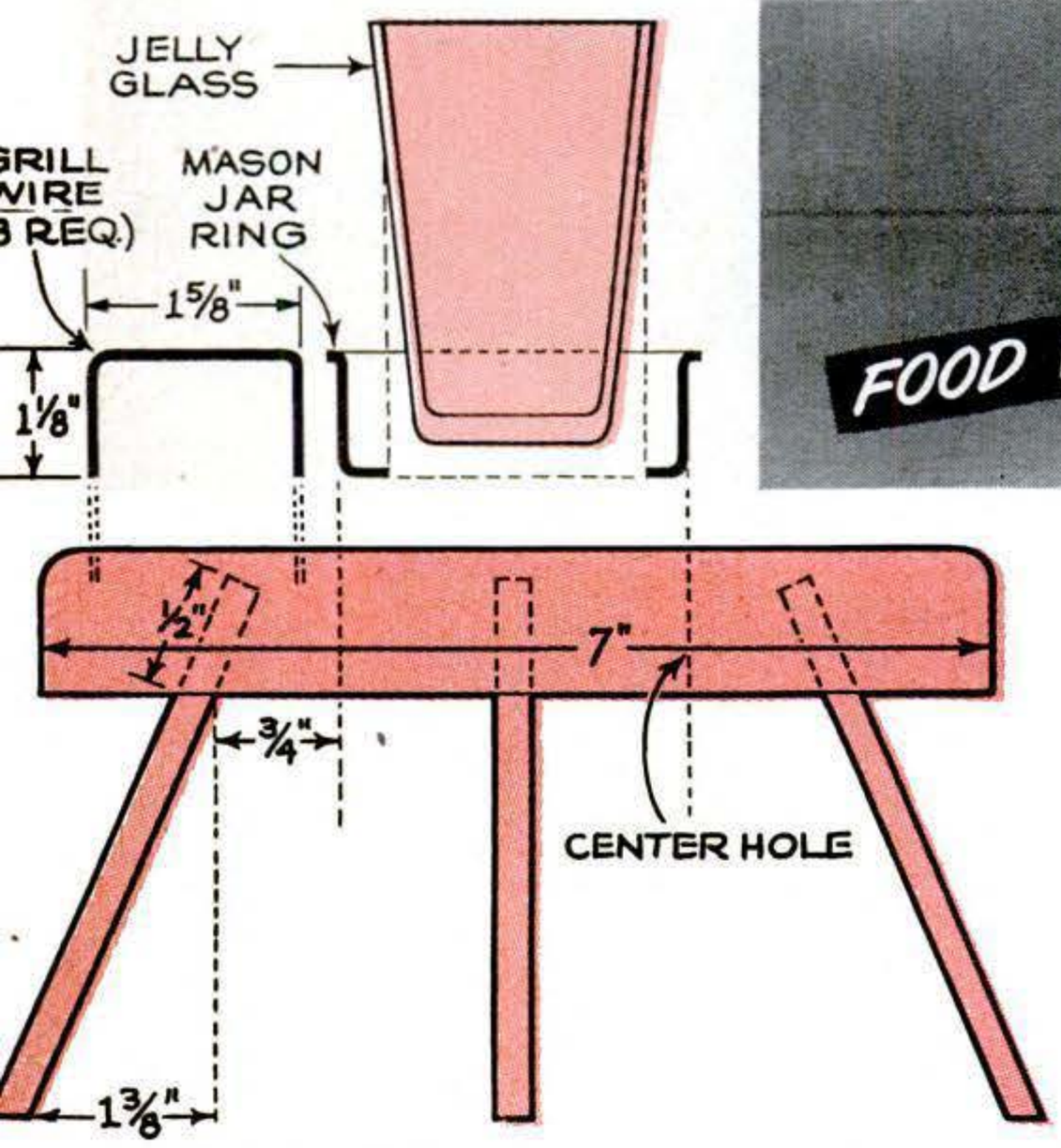
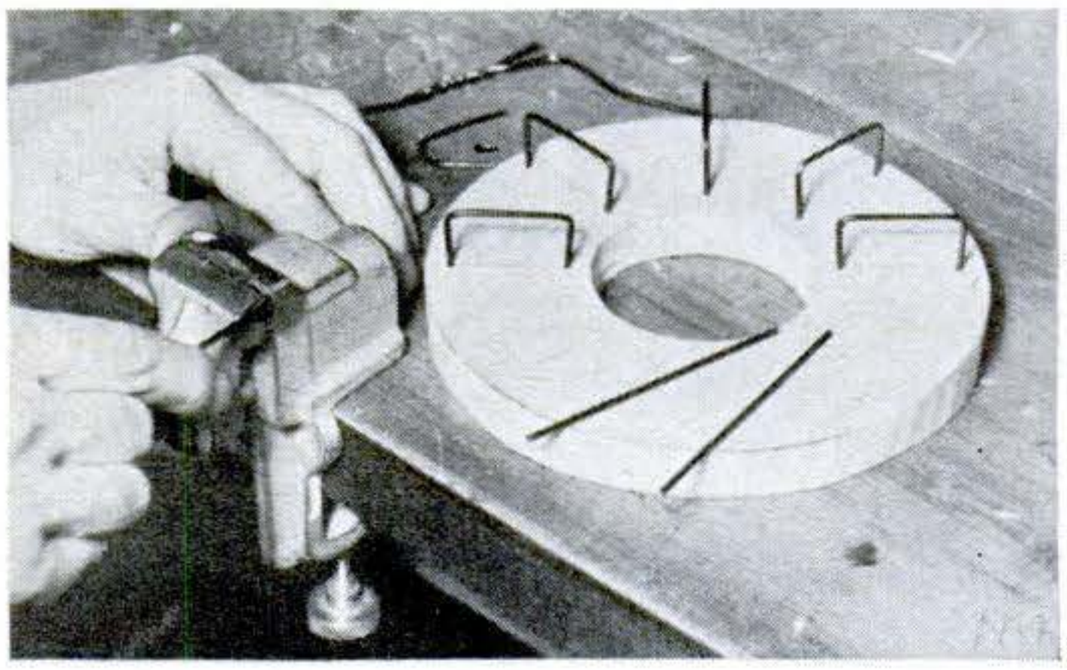
One Evening Shop Projects

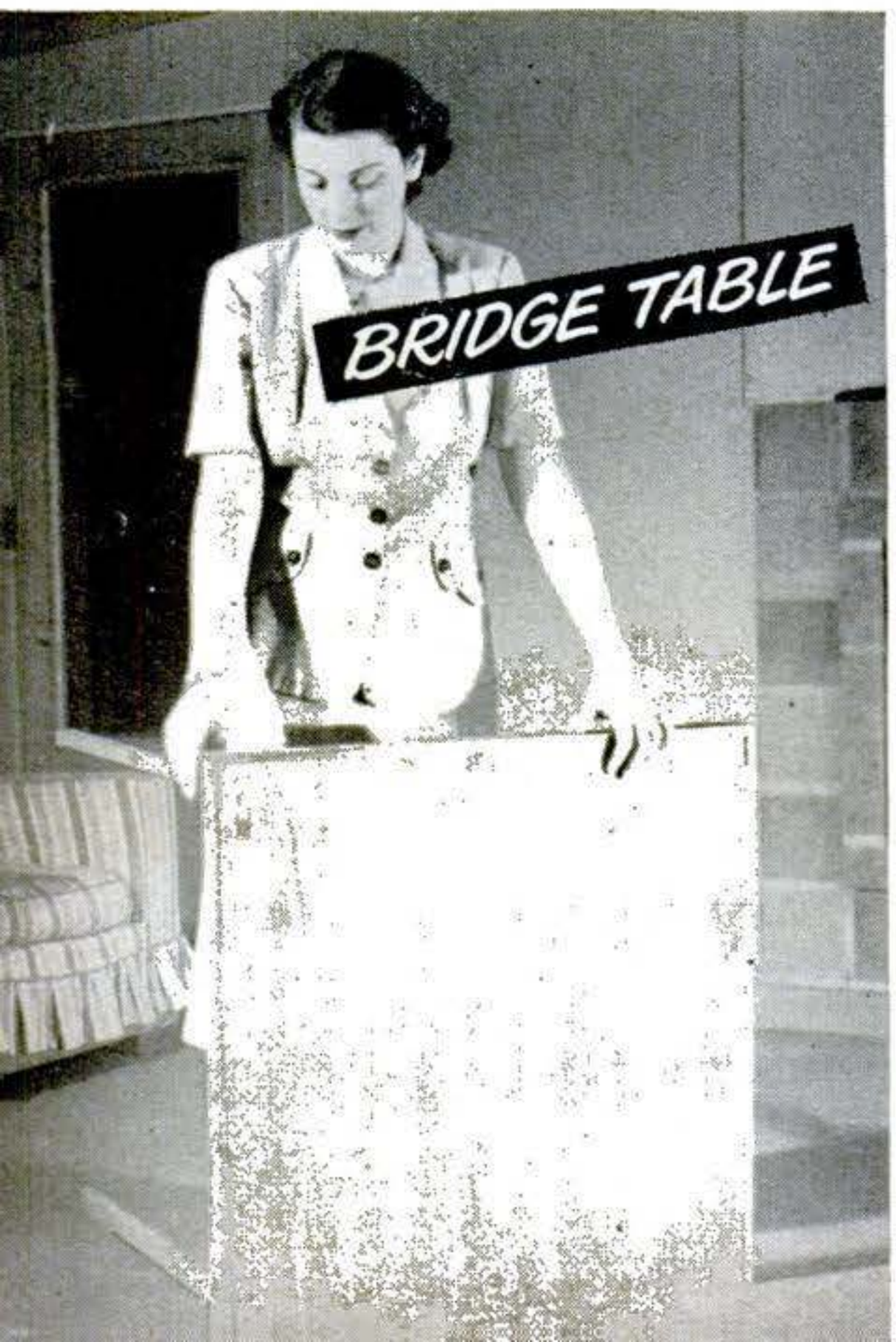
FOOD WARMER



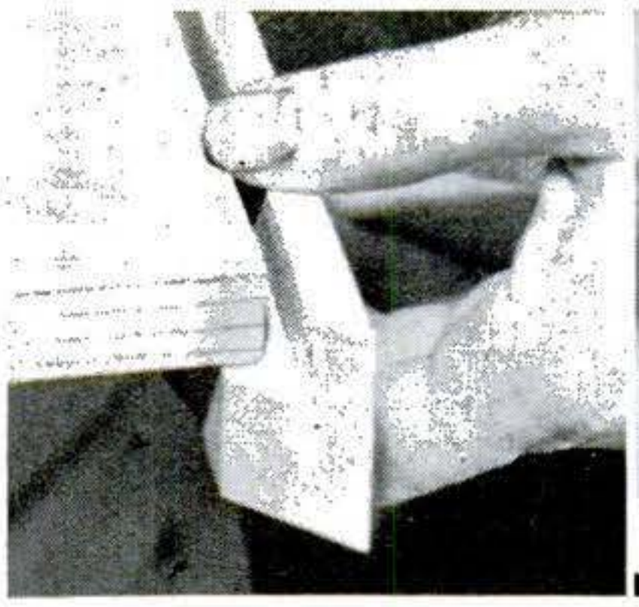


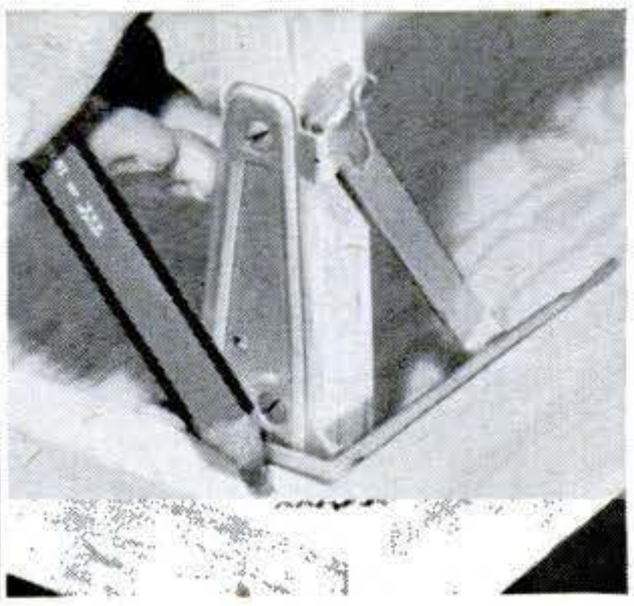
Autumn suppers outdoors stay piping hot with a warmer like this. If you're a scrap saver, it costs nothing.

The top is ¾″ pine. Bore a center hole with an expansive bit to accept a metal mason-jar ring. After jigsawing it into a circle, drill holes for the angled legs (a jig helps). Before gluing in the dowel legs, drill holes just big enough for the coat-hanger-wire grill pieces, which you can bend in a small vise (above). A tapered jelly glass fits into the mason-jar ring to hold an ordinary candle. There's no danger of scorching the wood frame, but make sure the bottom of the glass is at least 1½″ above the table top.—*Sylvester J. Zuk, Chicago.*



BRIDGE TABLE





If your old card table is on its last legs, here's one you can turn out after dinner. The top, a 27″ square of ¾″ plywood, fits into a ¾″ rabbet in 1¼″-by 2″-by-29½″ sidepieces (left above). Nail and glue sidepieces to the top, with corrugated fasteners at the mitered ends (right above). Legs—1″-by-1¼″ clear pine long enough to make the table 26″ high—are fastened to the sidepieces with folding hardware.—*Bill Cartwright, Pittsford, N. Y.*

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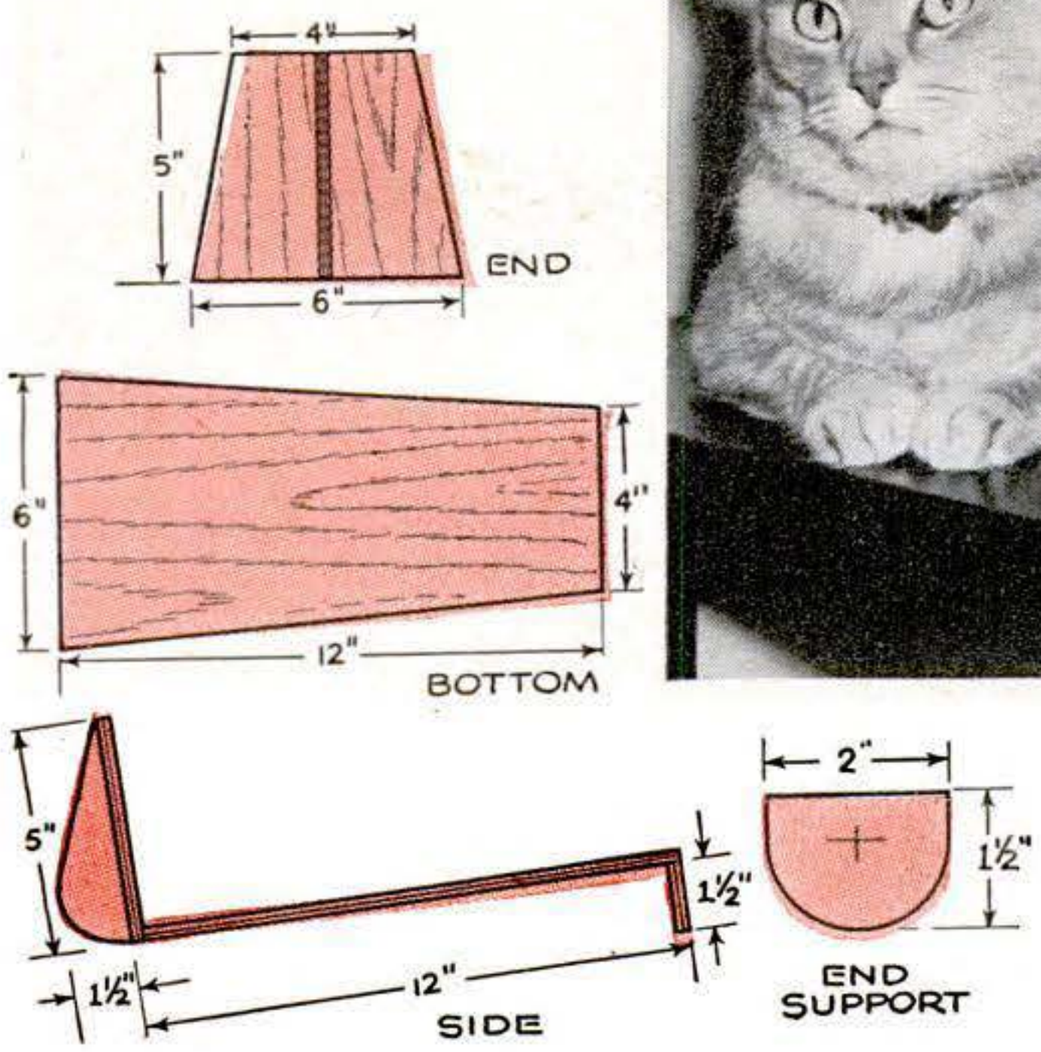
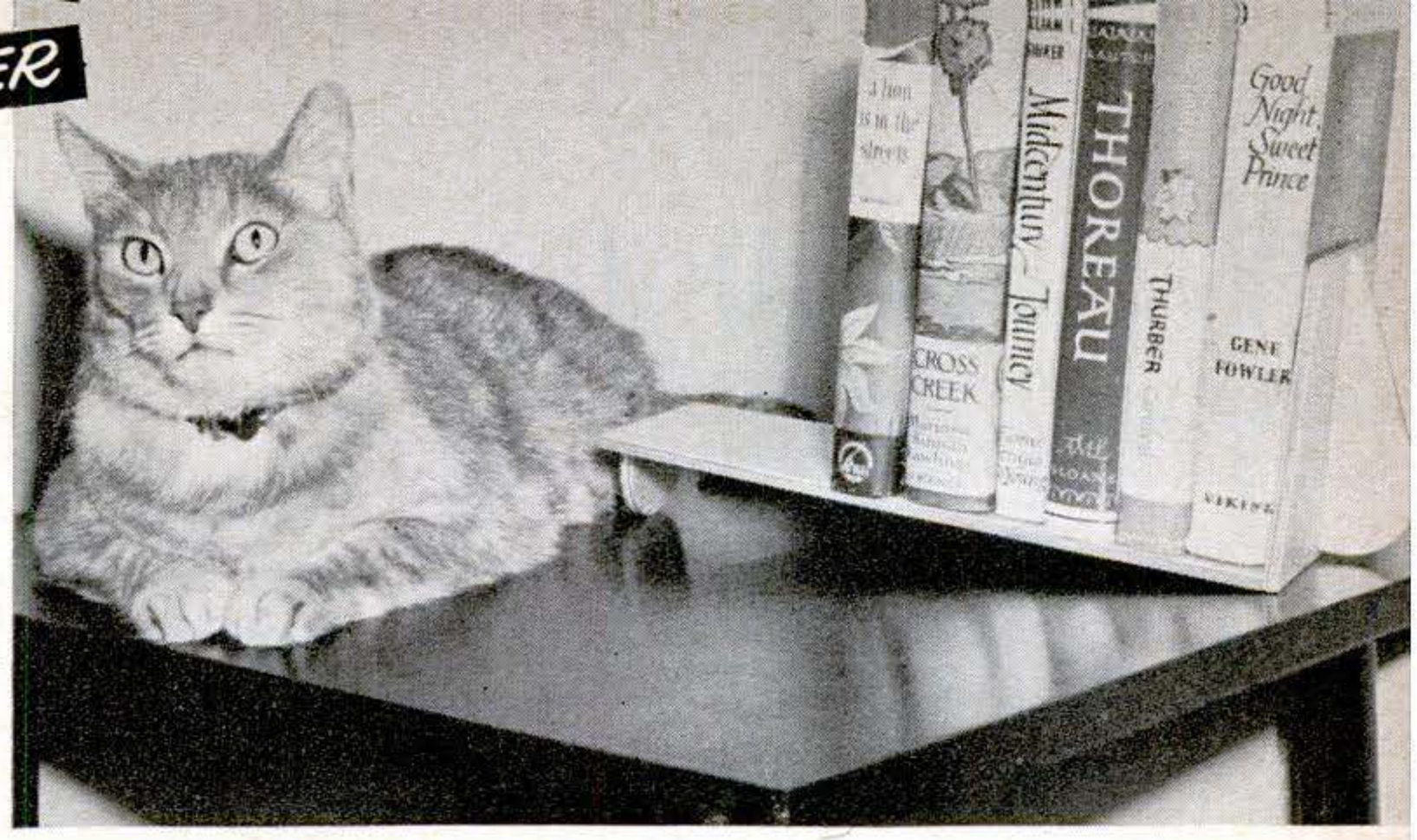
BOOK HOLDER

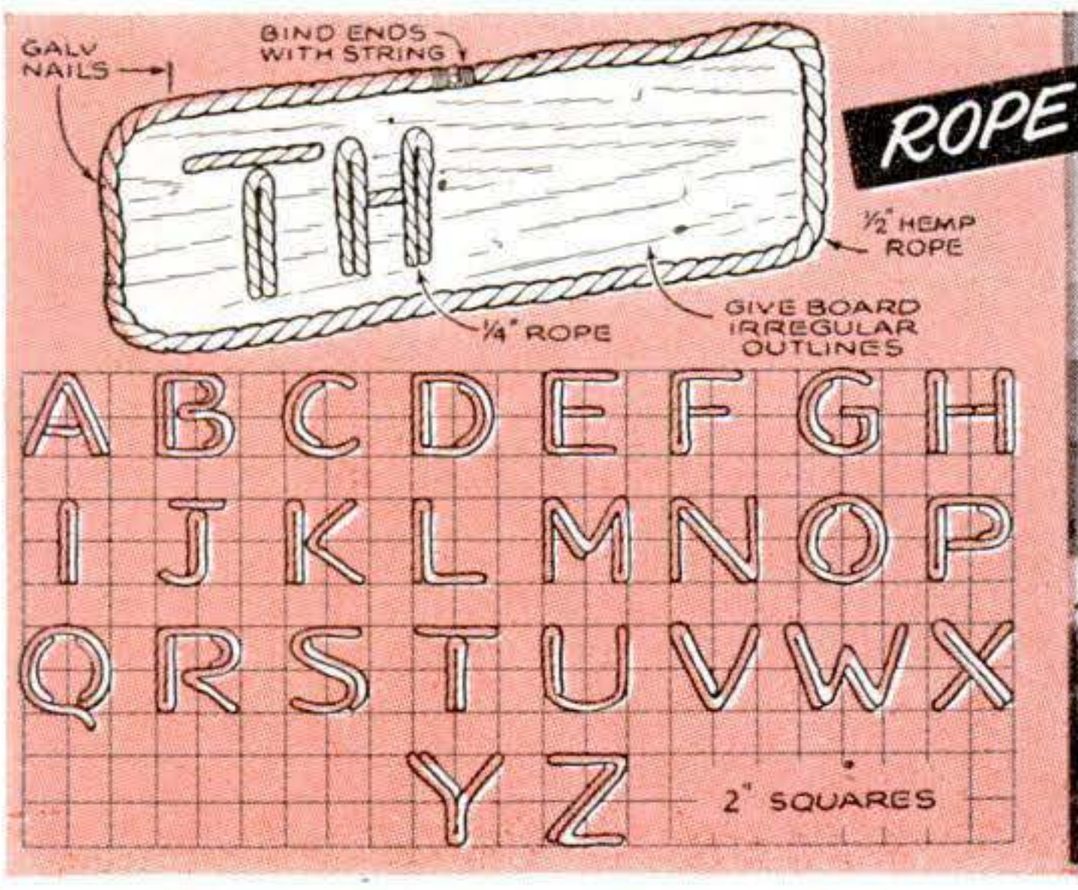




Books stay neatly in place because of the slight tilt of this modern holder. It was made from a few scraps of ¼″ pine plywood, joined with nails and glue. Clear lacquer gives the one above a rich natural finish.—*John Rogers, Dallas.*

A piece of linoleum about 14″ by 17½″, a tin funnel, a coffee can and some copper wire are the makin's for the big ash-catcher that most dens and shops need. The linoleum is formed into the upright cylinder by wrapping it around the can and securing the overlap with metal paper fasteners inserted in punched holes. The coffee can, which catches the butts, just sits on the floor inside the cylinder. The cigarette rests are made by bending 10″ lengths of wire double and shaping the doubled wire around a broom handle. To support them, the ends are stuck through holes punched in the funnel with a nail. The linoleum is disguised with white paint, the funnel enameled black.—*Ray L. England, Columbia, Mo.*

ROPE SIGN



Rope offers an easy way to make a neat sign identifying your house. The letters are shaped from ¼″ line—doubled for some parts—and fastened to a rough board with brass escutcheon nails. Use ½″ rope for the border, and bind cut ends.

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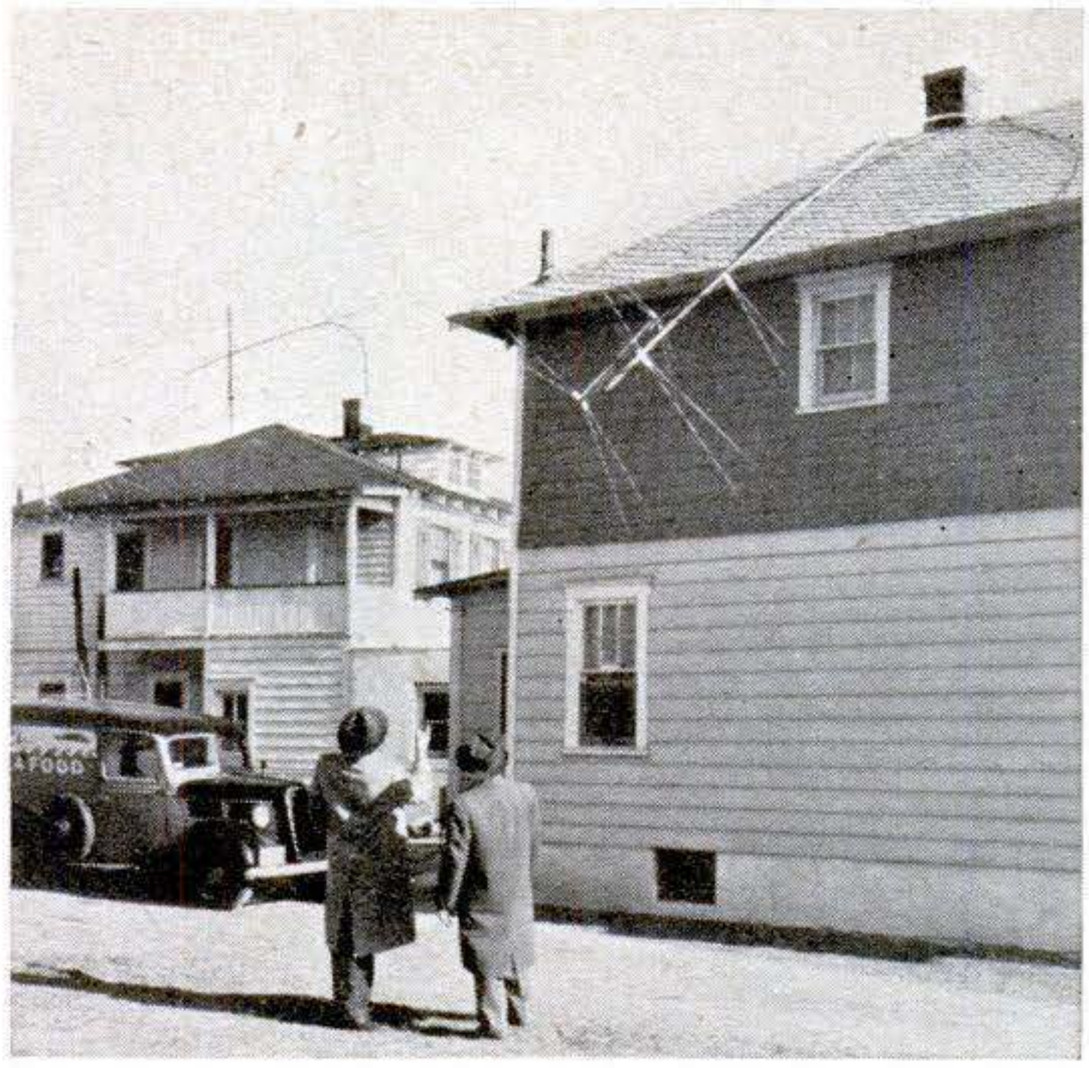
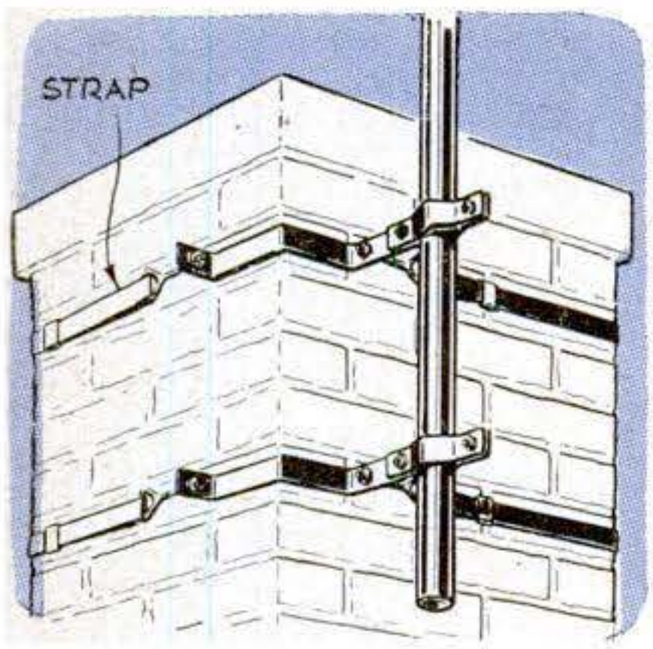
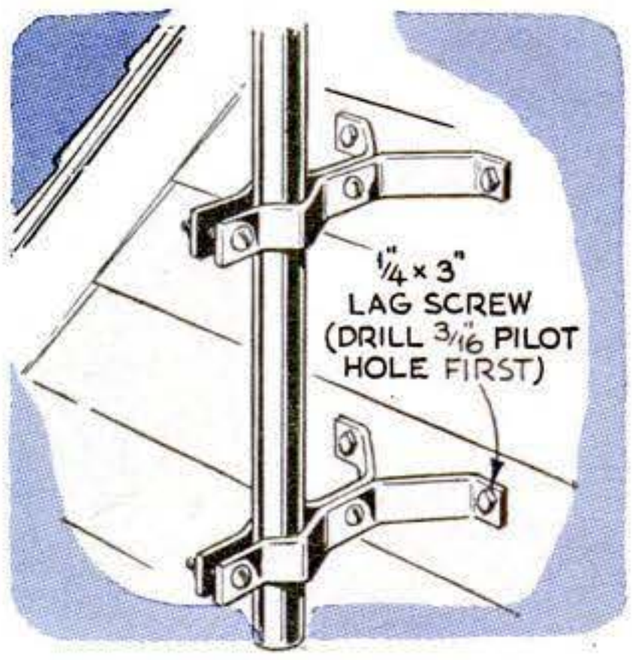
Windproofing Your TV Antenna

A strong wind can turn your shiny aerial into a mess of scrap—and take part of your house along with it. Make sure yours is up to stay.

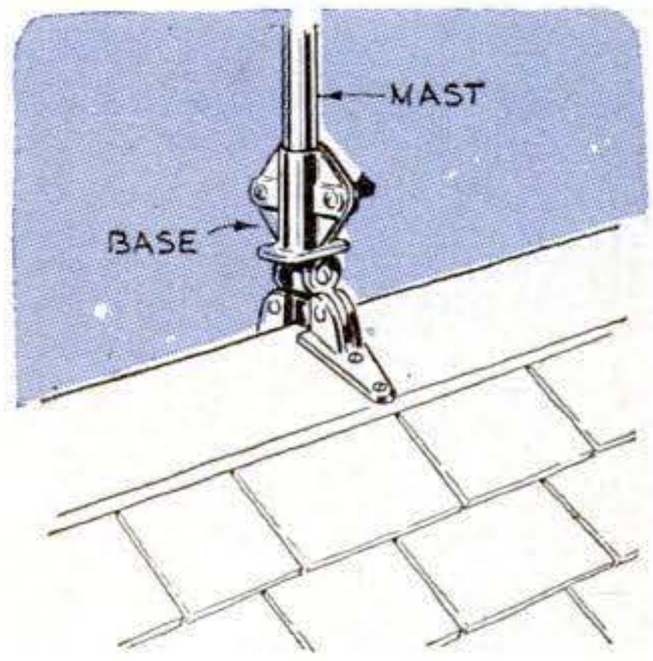




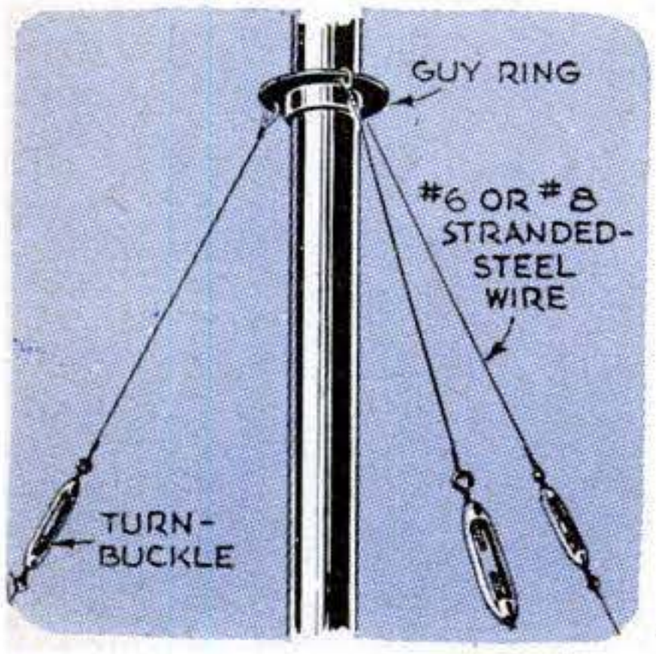
Base of mast must be firmly anchored or it may pull away even though top is guyed tight. If antenna mounts on chimney, make sure masonry is sound—weakened chimneys have been torn away right along with mast.



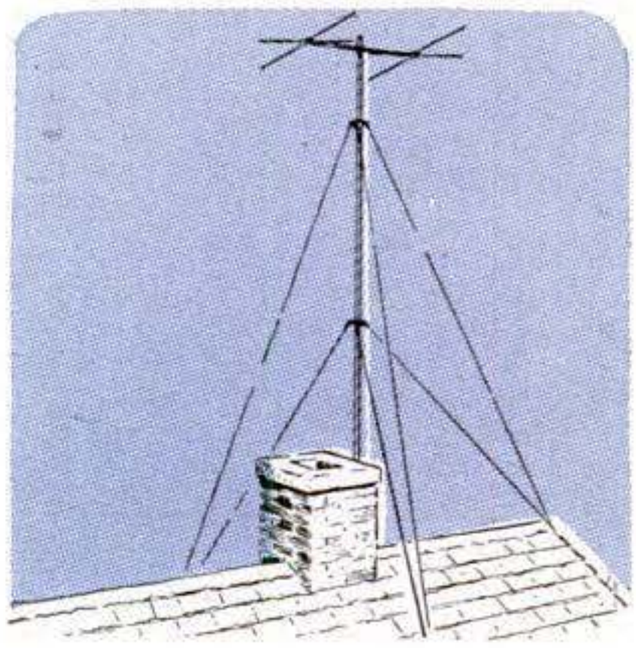
If antenna is mounted on house, use stand-off brackets and lagscrew into studs. Studs are found at corners and beside vents, windows. In masonry, bore holes with star drill, then insert expansion plugs for screws.



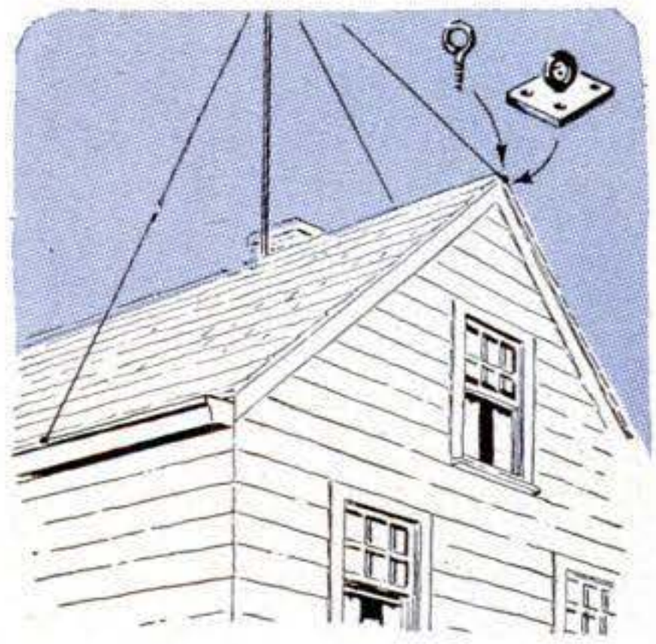
A rooftop mount anchors mast to peak where chimney is not present or can't be used. Mount is lagscrewed firmly into ridgepole of house, but requires guy wires on even short masts as it gives little lateral support.



Guy wires keep mast from bending. Attach wires to ring anchor near top and tighten with turnbuckles until just taut—overtightening may buckle mast. Use three or four guys for masts up to 15′, six up to 25′.



Tall antennas, 25′ or over, should have two sets of guys, one at middle and one at top, to distribute strain. Aluminum tubing, suitable for low masts, should be replaced with stronger steel tubing for high masts.



Anchor guy wires to eaves or side of house, not to roof where leaks might occur. Use screw eyes for light masts, rings on screw plates for heavy ones. On masonry, screw rings into expansion plugs set in holes.

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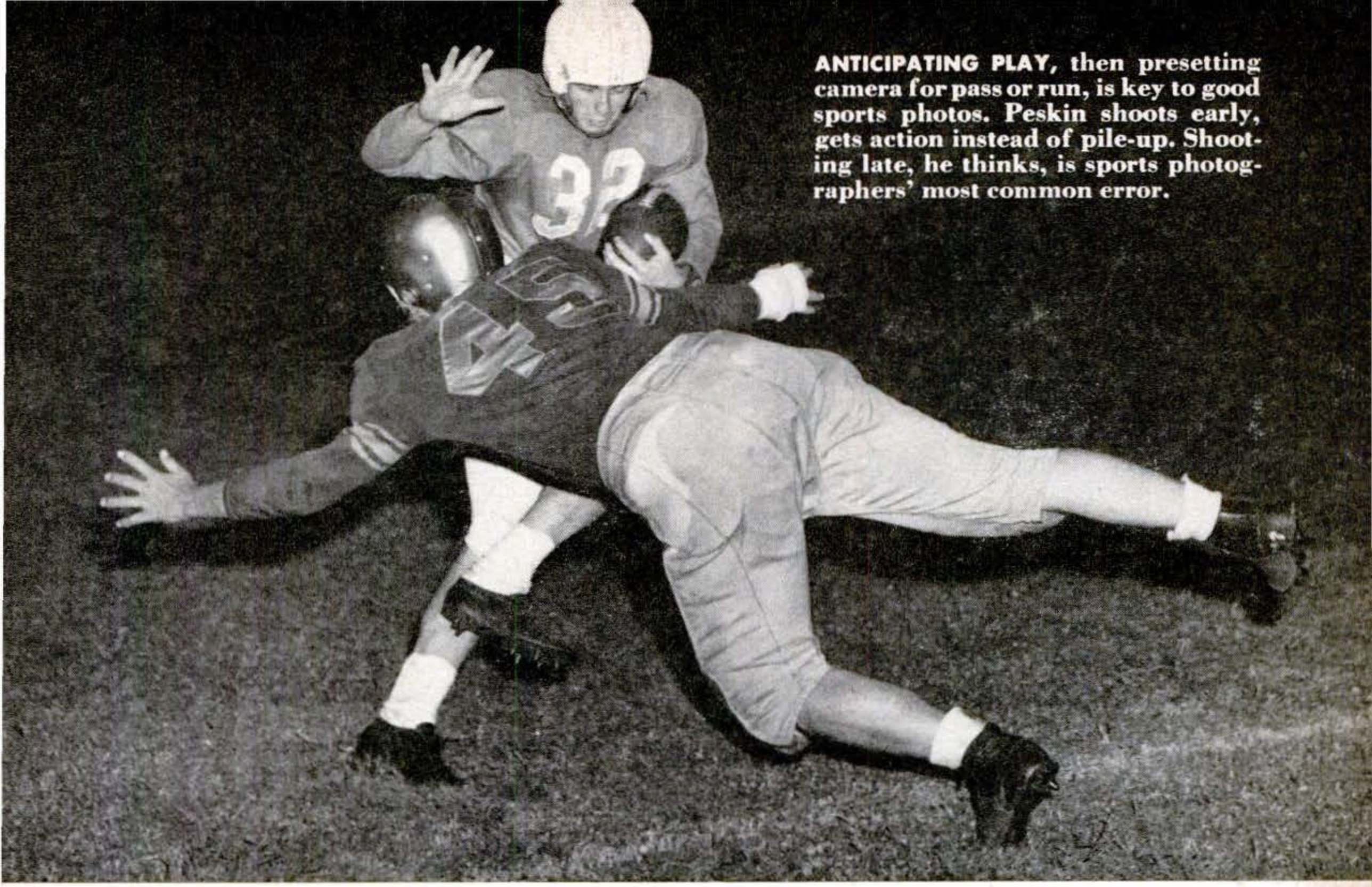

ANTICIPATING PLAY, then presetting camera for pass or run, is key to good sports photos. Peskin shoots early, gets action instead of pile-up. Shooting late, he thinks, is sports photographers' most common error.

How a Pro Shoots Football

Tips from a top sports photographer will help you catch the big game's thrills in your own pictures.

By Dave Stanley

SEPTEMBER busts out all over the U.S.A. with football fever: practicing cheerleaders, pessimistic coaches, optimistic alumni, wild Rose Bowl forecasts—and Hy Peskin.

Wiry, boyish-faced, 37-year-old Peskin is one of the country's hottest sports photographers. He has shot more than a thousand picture stories for newspapers and magazines during the last 15 years, everything from hot-rod contests to rodeos. But football is his passion. From now through December

OFF-FIELD ACTIVITY is often as dramatic as play. Here Peskin catches reaction of bench at tense moment. Grandstand amateurs can adapt technique by presetting camera for eight feet and shooting into crowd.

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GOOD ACTION SHOT lets you pick out individual elements—runner, blocker, defense—instead of jumbled mass of players. Action is also heightened by "frame," the stadium backdrop. Sideline shooting is rough on clothes, so wear your oldest duds.

OFF-THE-GROUND ACTION makes best sports shots, believes Peskin, is also effective for sideline color, as above. When shooting cheerleaders and band formations from sidelines, kneel, so as not to block spectators' view.

DON'T LET DARKNESS or bad weather stop you. As light fails or rain sets in, open lens wider, even shoot a little slower, but don't quit. Often it's the last couple of plays in each half that can make the big picture.

his "studio" will be the big gridirons from Yankee Stadium to the Cotton Bowl. His job isn't easy. He doesn't have the slightest notion what will happen, or where. He can't go back the next day and shoot again. He can't control the lighting. Yet he'll bring back thrilling action pictures every time. Small wonder that leading magazines pay him about $25,000 a year to cover major sports events for them.

You've Got to Anticipate

The secret? "Anticipation," Peskin says. "That's the heart of action photography because in sports a split second is an eternity. You've got to visualize what will happen and be ready to shoot a half moment before the peak of the action."

Sports photographers usually shoot from two places: the top of the press box up in the stands, and the sidelines. "With a long-range camera from the upper press box," explains Peskin, "you're cozy, you're on top of the action with a flick of the camera. You can have your hot coffee and pictures, too."

It's tougher on the sidelines, but that is where many of the best football photos are made. Peskin illustrates his technique this way: "Suppose you're trying to get a picture of a star pass receiver. It's very difficult to follow him down the field and keep him in

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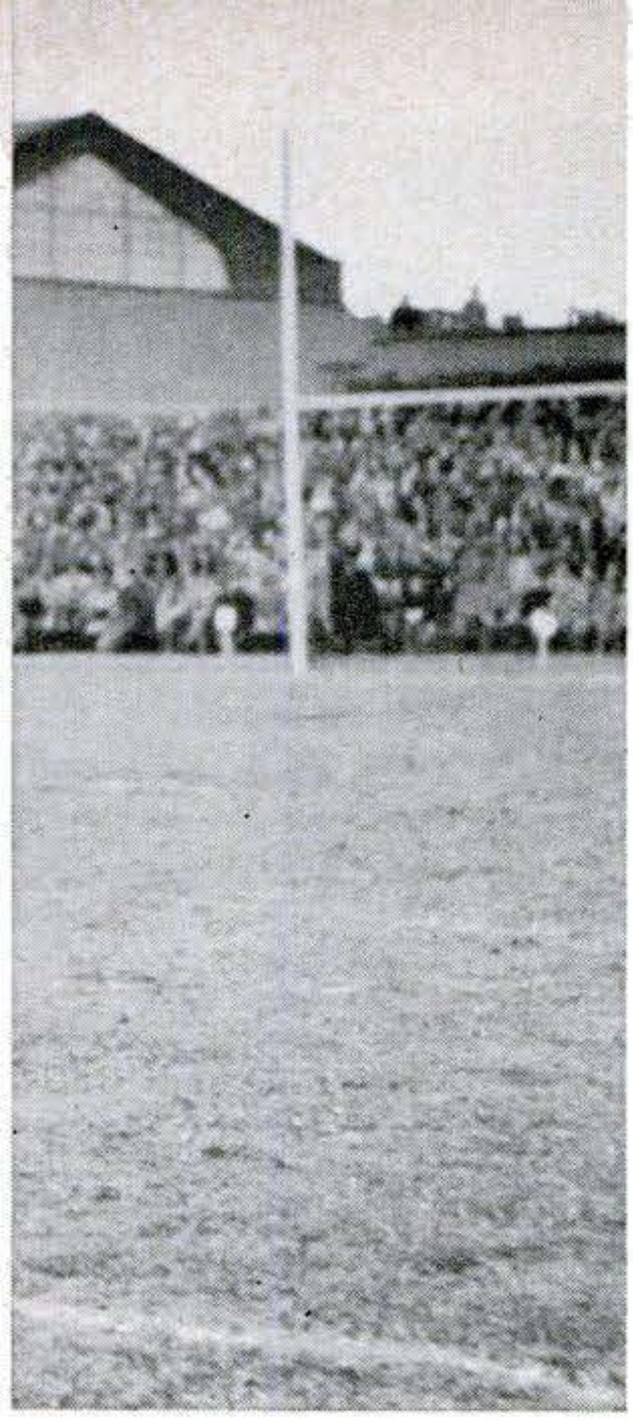
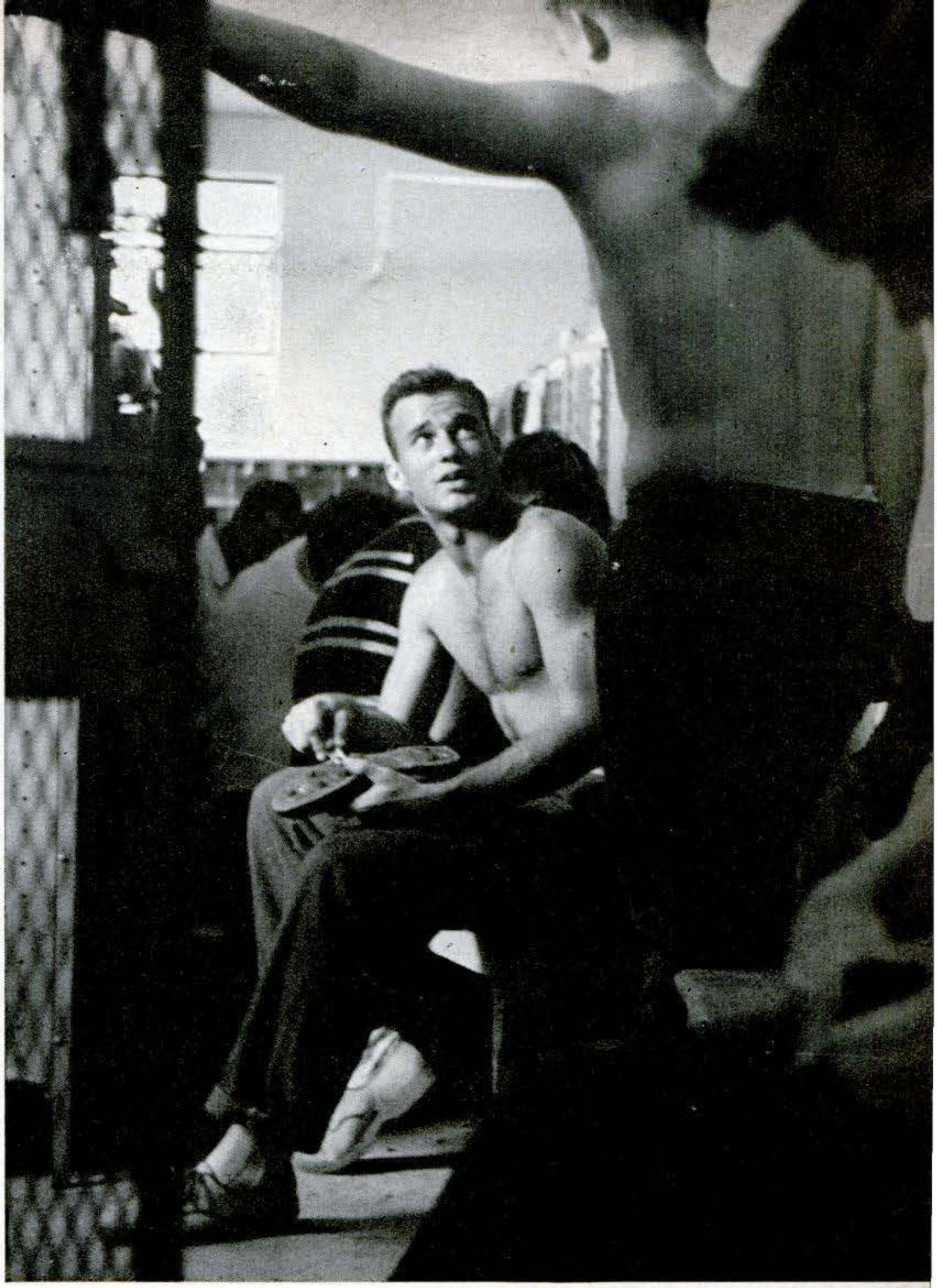


Photographed for Life *by Hy Peskin*
© Time, Inc.



CANDID SHOTS taken in locker rooms or at practice sessions make fine pictures, may also get you a pass to shoot at regular games. Show your best ones to local school coach, and usually he'll say okay.

focus with a camera when you have to look down into a box. It's best to use a camera with a sports finder. That way you can follow the action both visually and physically and still see what's coming in and out of the picture." Some of his most effective shots are made from the sidelines, but with his back to the game—dramatic reactions of the crowd or the players on the bench.

He Arrives Well-Heeled

When Peskin travels 1,000 to 3,000 miles to cover a single afternoon of football, he arrives like a portable photographic store. His arsenal includes:

- Big Bertha, the long-range press-box standby, which weighs nearly 50 lb., costs $1,000 and has 28″, 40″ and 60″ lenses.
- A Speed Graphic with a 10″ lens for sideline shooting.
- A Rolleiflex, also for sideline shooting.
- A Leica, for candid shots in the locker room without flash.

He uses high-speed film for black-and-white, Ektachrome for color. "I don't do my own processing," he says. "If I didn't get a picture, no amount of super-duper developing or printing is going to change anything."

Peskin has come a long way from his $12-a-week start as hypo boy on the New York *Daily Mirror*. He now lives with his wife and two athletic young sons in a comfortable house on Long Island Sound. Hobbies? Photography. The famous sports cameraman can't even swim. END

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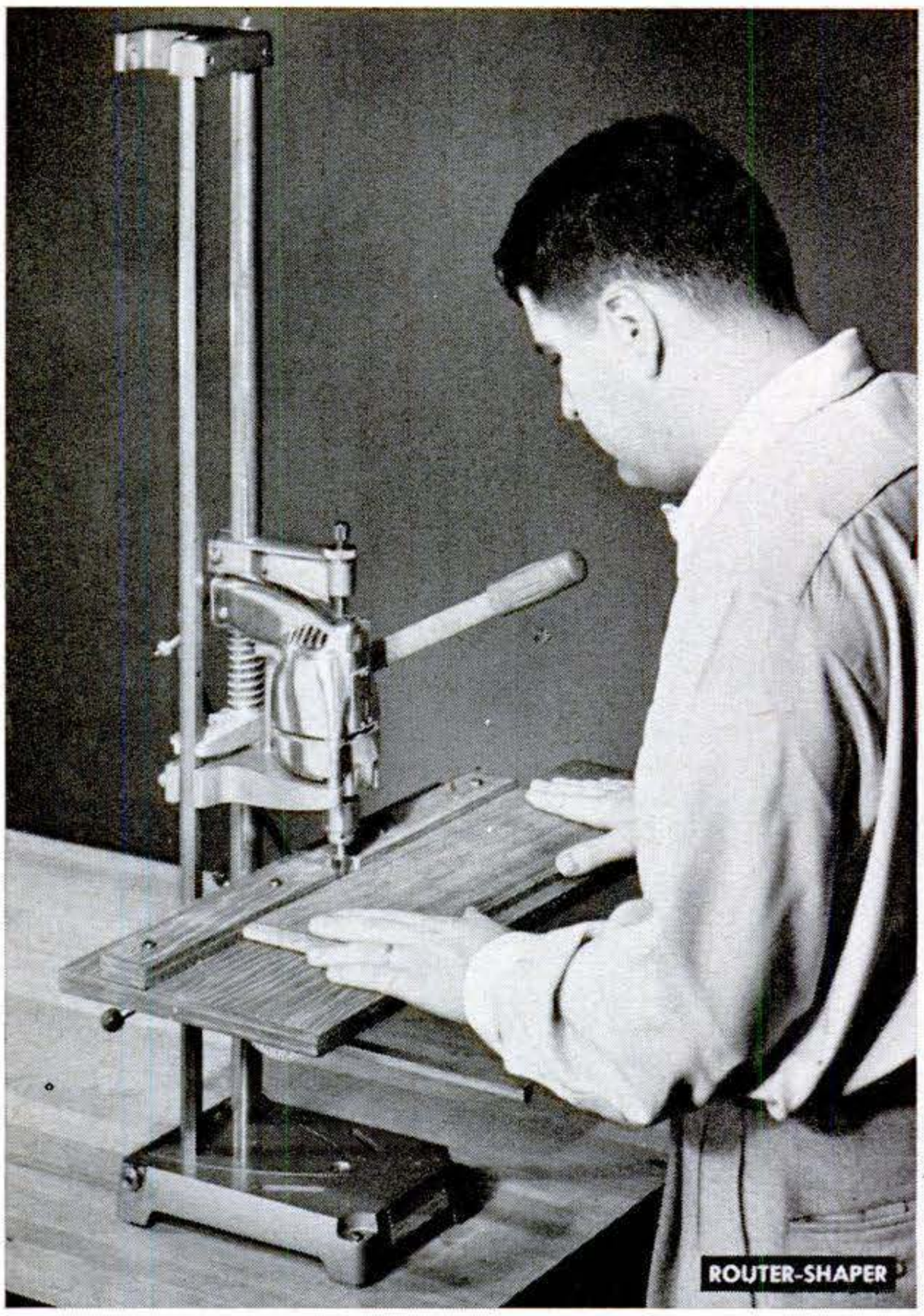

ROUTER-SHAPER

WOOD LATHE

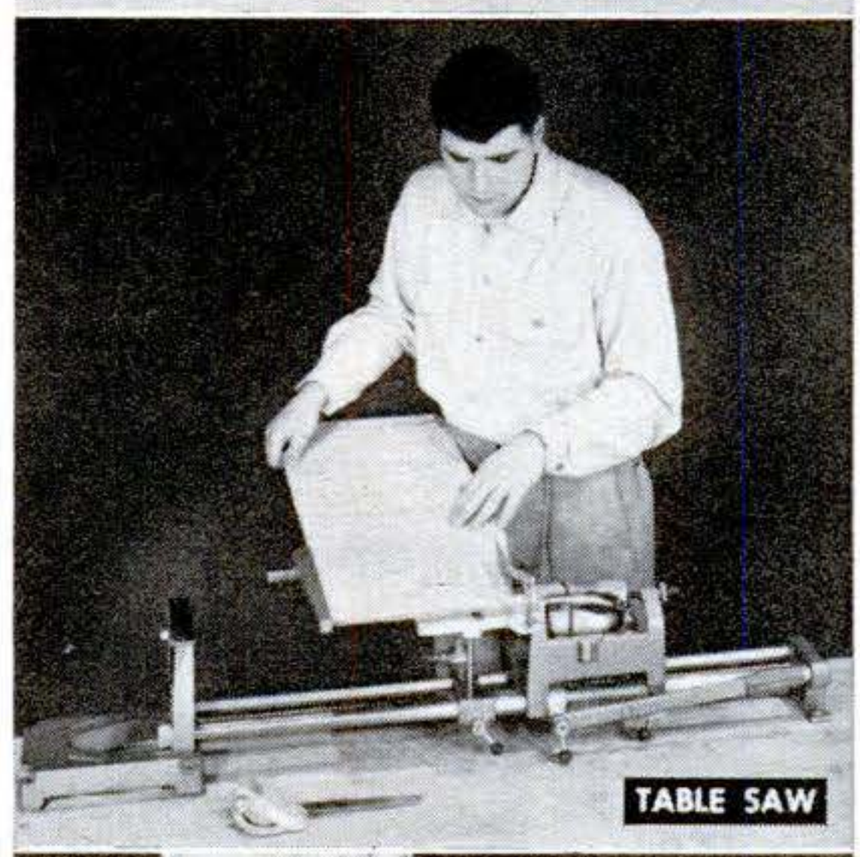


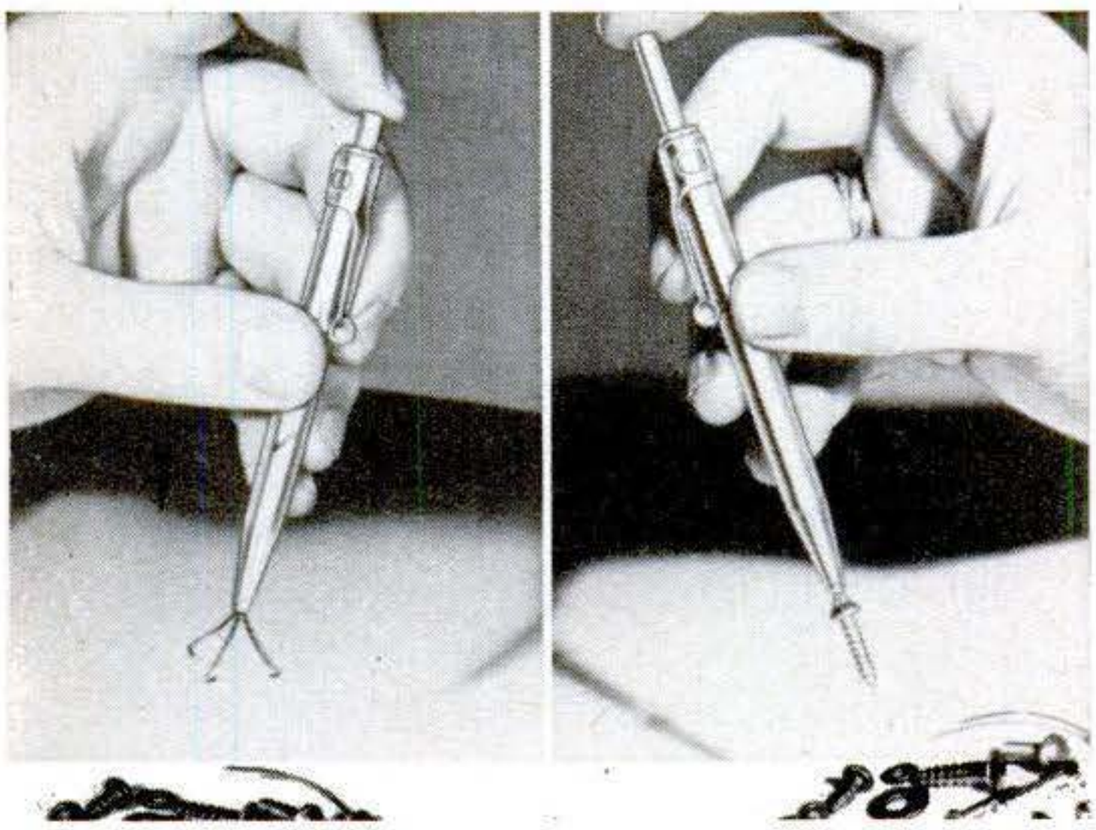
TABLE SAW

DISK SANDER

Electric Drill Does Job of Seven Tools

WITH this combination of accessory stand and electric drill you can perform operations that normally require seven different power tools. A flip of a lever locks the drill securely in the head of the stand. The outfit can be set up as a lathe, bench saw, vertical drill press, horizontal drill press, disk sander or router-shaper—and the drill can be used separately. A jigsaw is also available for the stand.

The Do-It Shop is portable enough to be used anywhere—even on the kitchen table. *Cummins-Chicago Corp., 4740 N. Ravenswood, Chicago.*



Three-Fingered Tweezer Grips Small Objects

DEPRESSING the plunger on this tool causes three spring-steel fingers to extend and flare outward to grip small objects. Releasing the plunger causes the fingers to retract and hold the object securely. Small parts that are hot, polished or sterile can be conveniently handled with the tool. It's the size of a pencil and has a clip for your pocket. *Win Sales Co., P.O. Box 257, Forest Hills, N. Y.*

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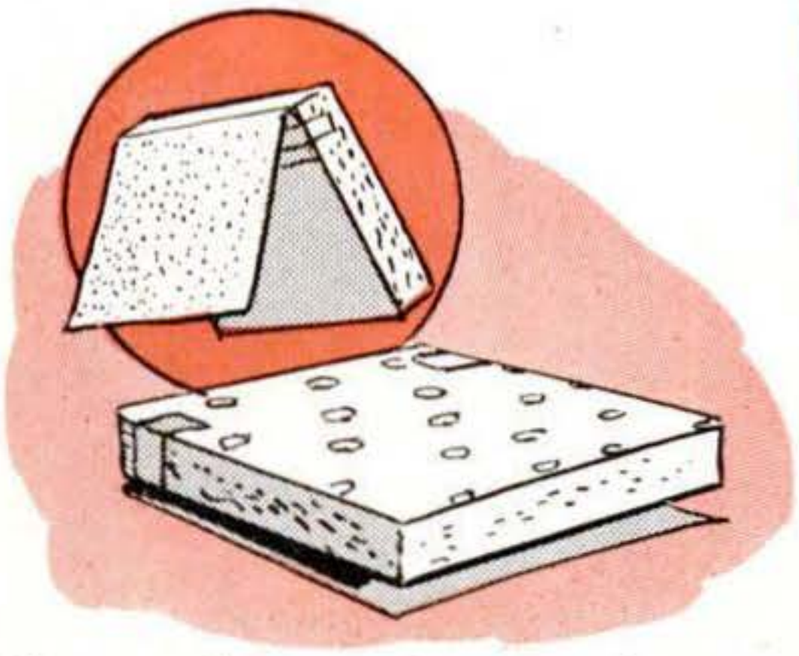
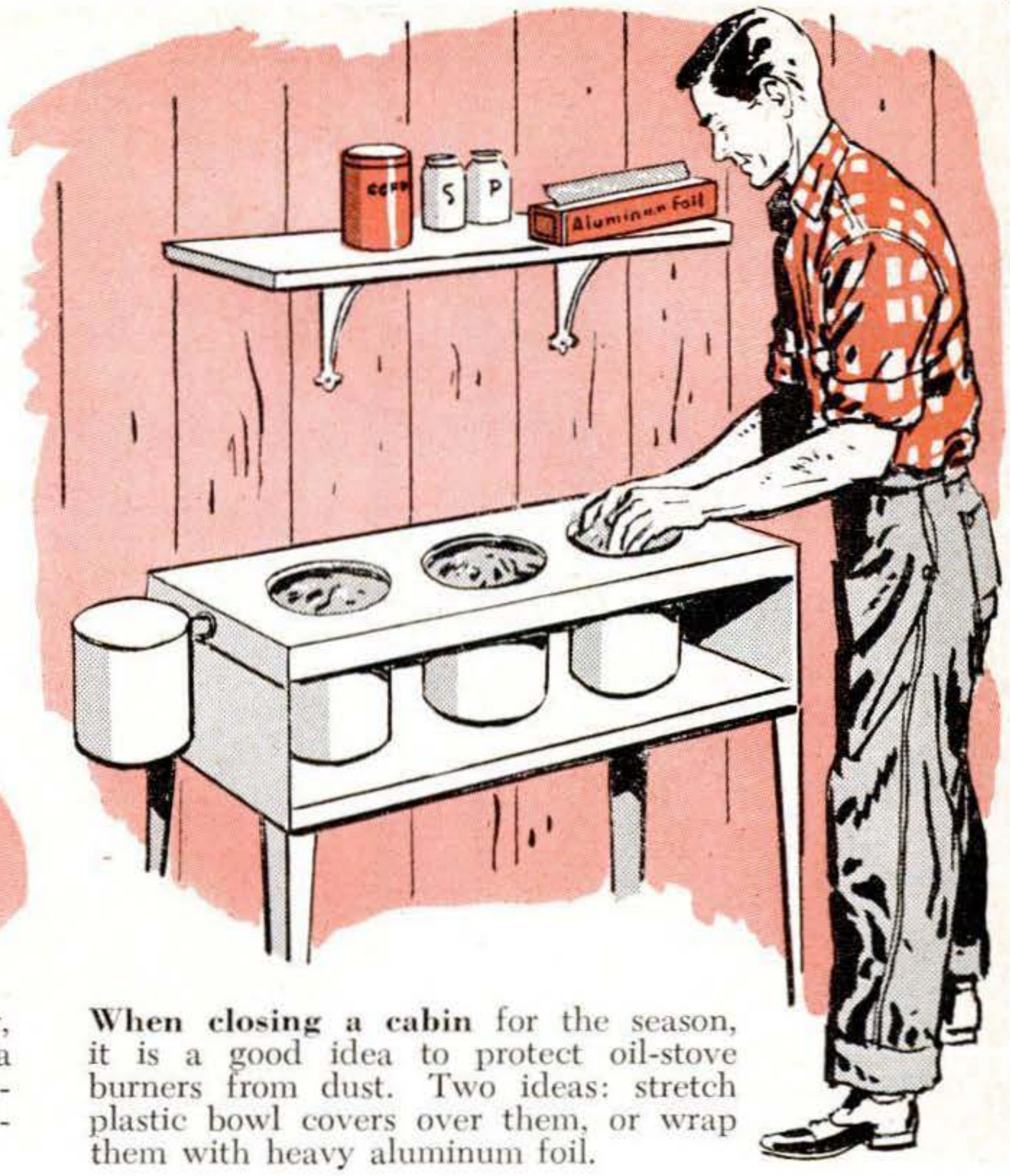
KEEPING THE *Home* SHIPSHAPE



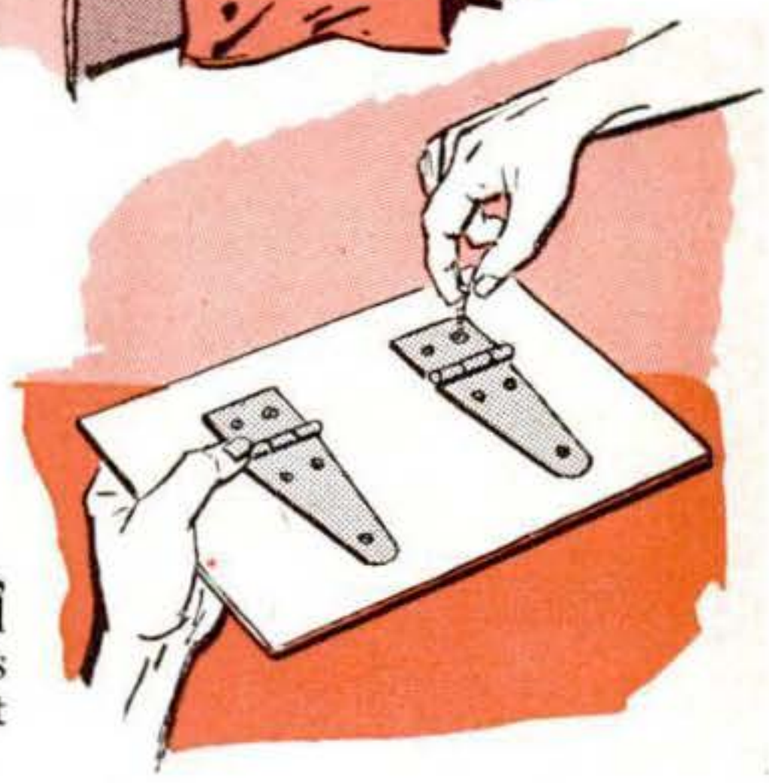
To get a better grip on sandpaper, tape it to the smooth side of a square of upholsterer's foam rubber. When sanding, insert fingertips in the exposed holes.



When closing a cabin for the season, it is a good idea to protect oil-stove burners from dust. Two ideas: stretch plastic bowl covers over them, or wrap them with heavy aluminum foil.

Marked road maps, showing how much of the country you have covered, make interesting wallpaper for a recreation room. Protect surface with lacquer.

Short a gluing clamp? Try raiding the pantry. The screw-on base of a kitchen meat grinder will sometimes work just as well as a regular clamp.



When you remove a hinge, fasten it to a bit of corrugated cardboard so that the screws won't be mislaid if you want to use it again.

Please turn the page for more new ideas.

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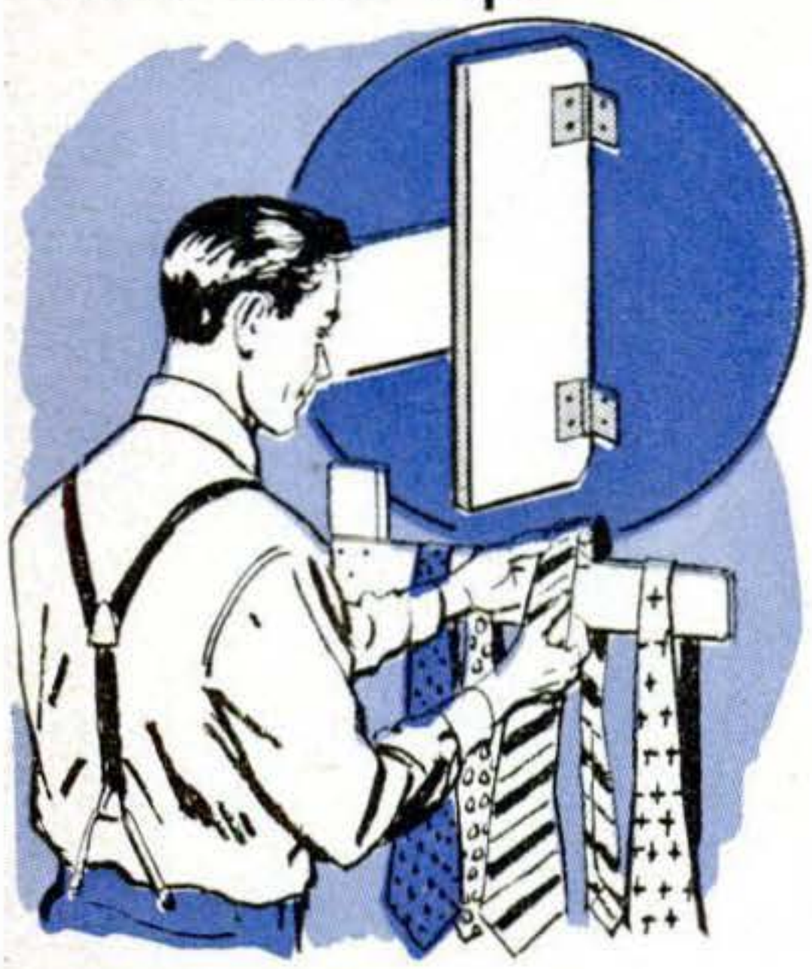
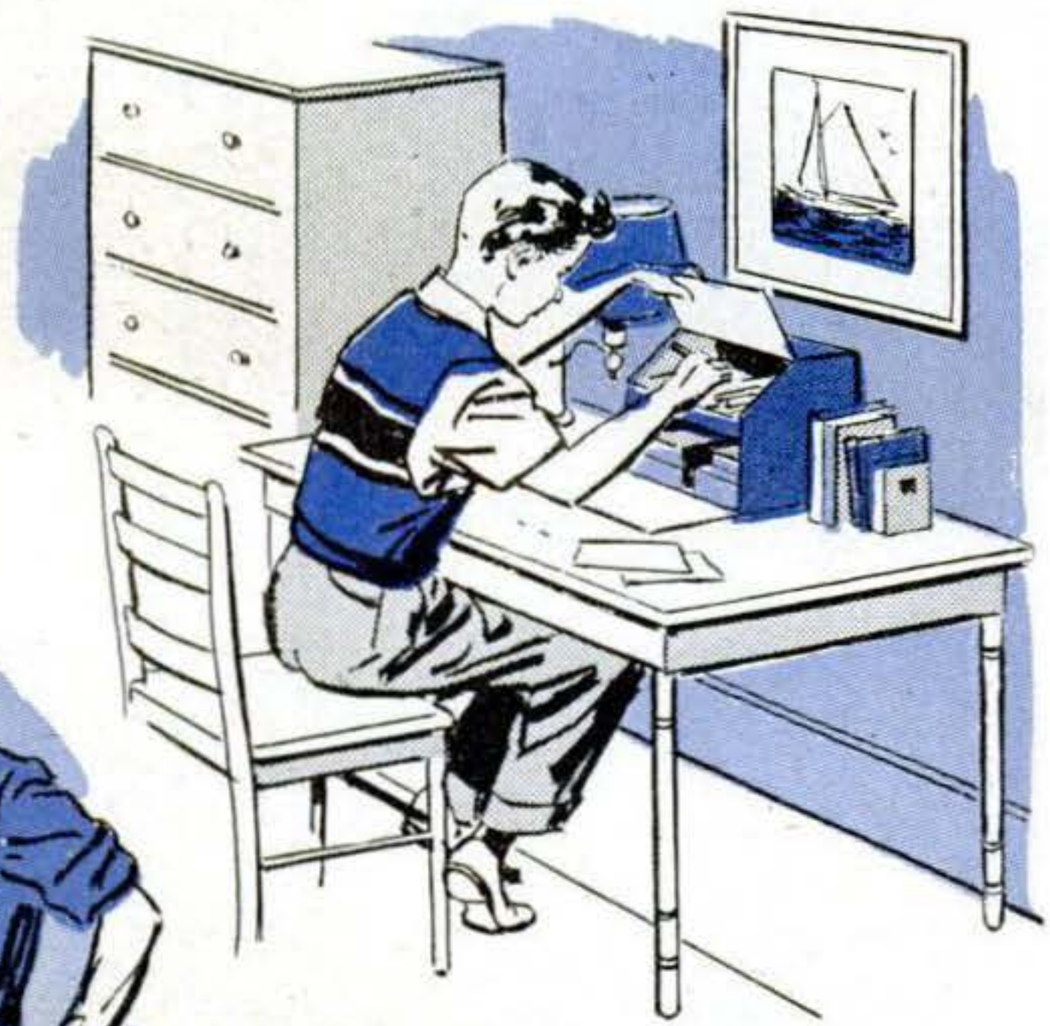
More Home Tips



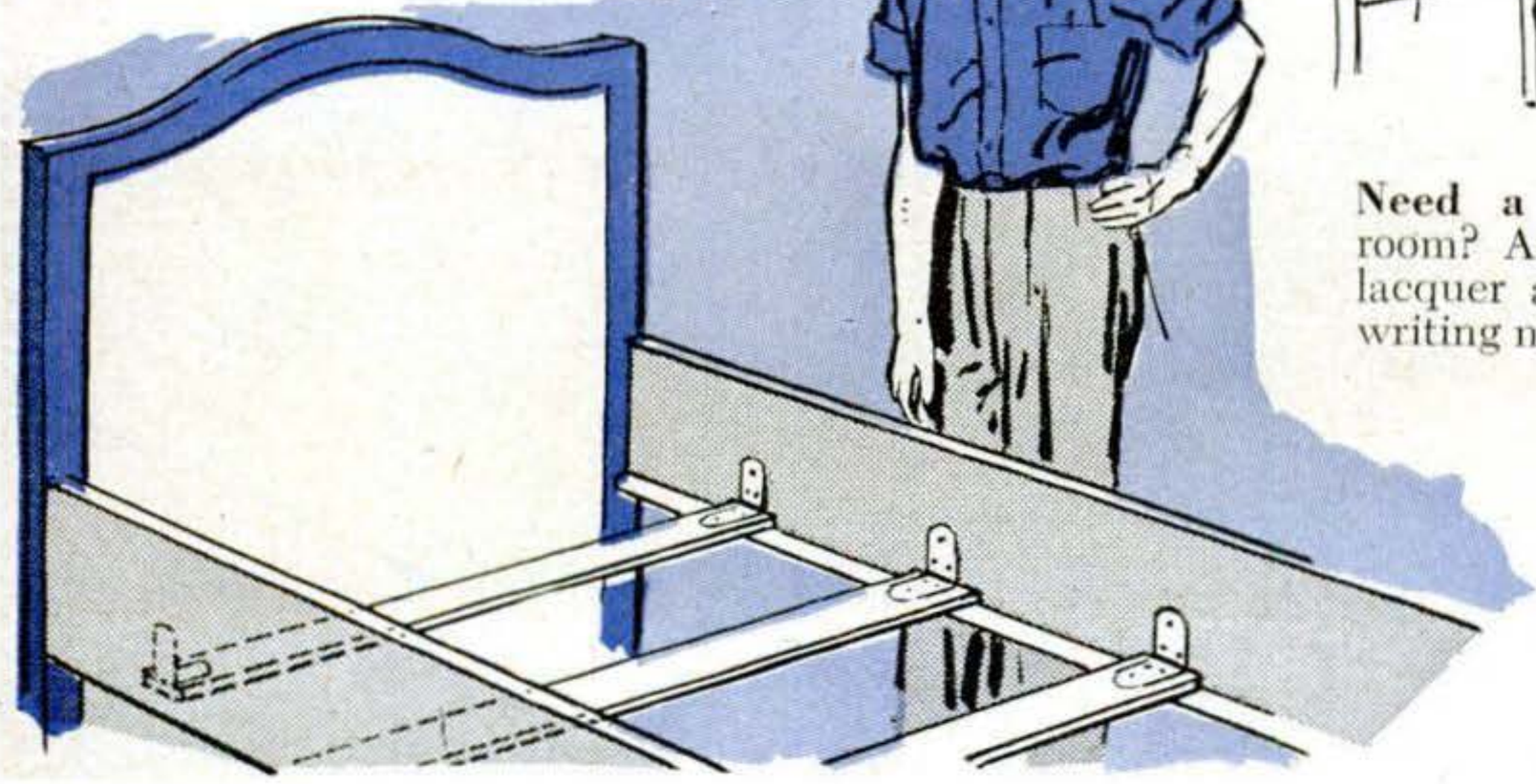
A tie rack can be made from an old T-square cut to a convenient length and attached to the wall with two small hinges. Left full length, it makes a good drying rack.

Blow out dust between radiator leaves with a vacuum-cleaner crevice nozzle. Damp cloths draped behind and below the radiator will prove helpful in catching the dust.

A desk light can be made from a spun-aluminum bowl or bun-warmer lid. Fit the cord-carrying pipe to a pipe flange screwed on a wood block.



Need a study desk in Junior's room? Any table will serve if you lacquer a metal breadbox to hold writing materials and other supplies.



Bed slats can't drop out of place because of spreading rails when loose-pin butt hinges are screwed to slats and rails as shown.

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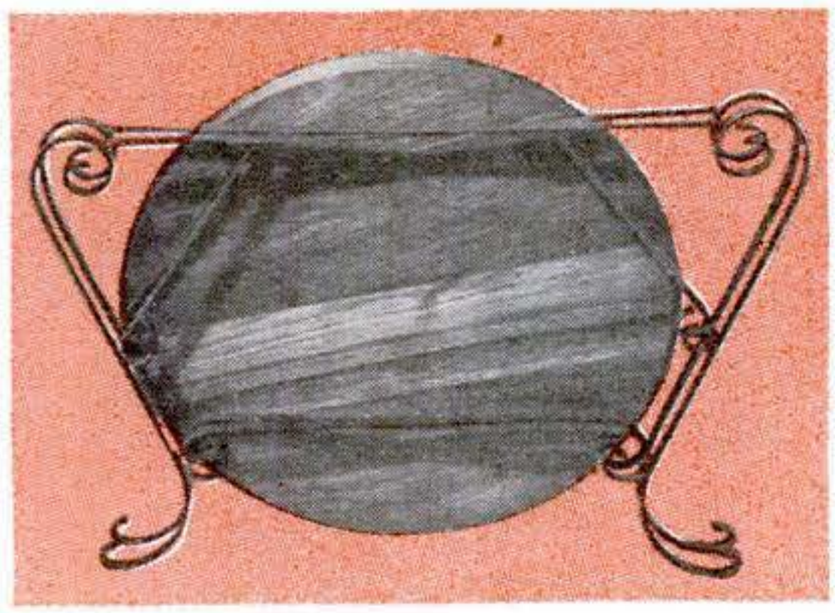
PICK YOUR PURPOSE. You may find use for this as a coffee, luncheon or lamp table, a hall or occasional piece. Top shown is walnut. White maple, oak or birch with a color-trimmed edge is an alternative scheme.



Wrought-Iron Table Folds for Storage

FRAME PIVOTS ON RIVETS. Wide offsets bent in one rail and stretcher accommodate the thickness of the other one. Single rivet joining each pair is left free enough to turn. Countersink underside of top for rivet head.

You don't have to be a welder to turn out handsome furniture like this. Just bend the parts, bang them together with a hammer and rivets.

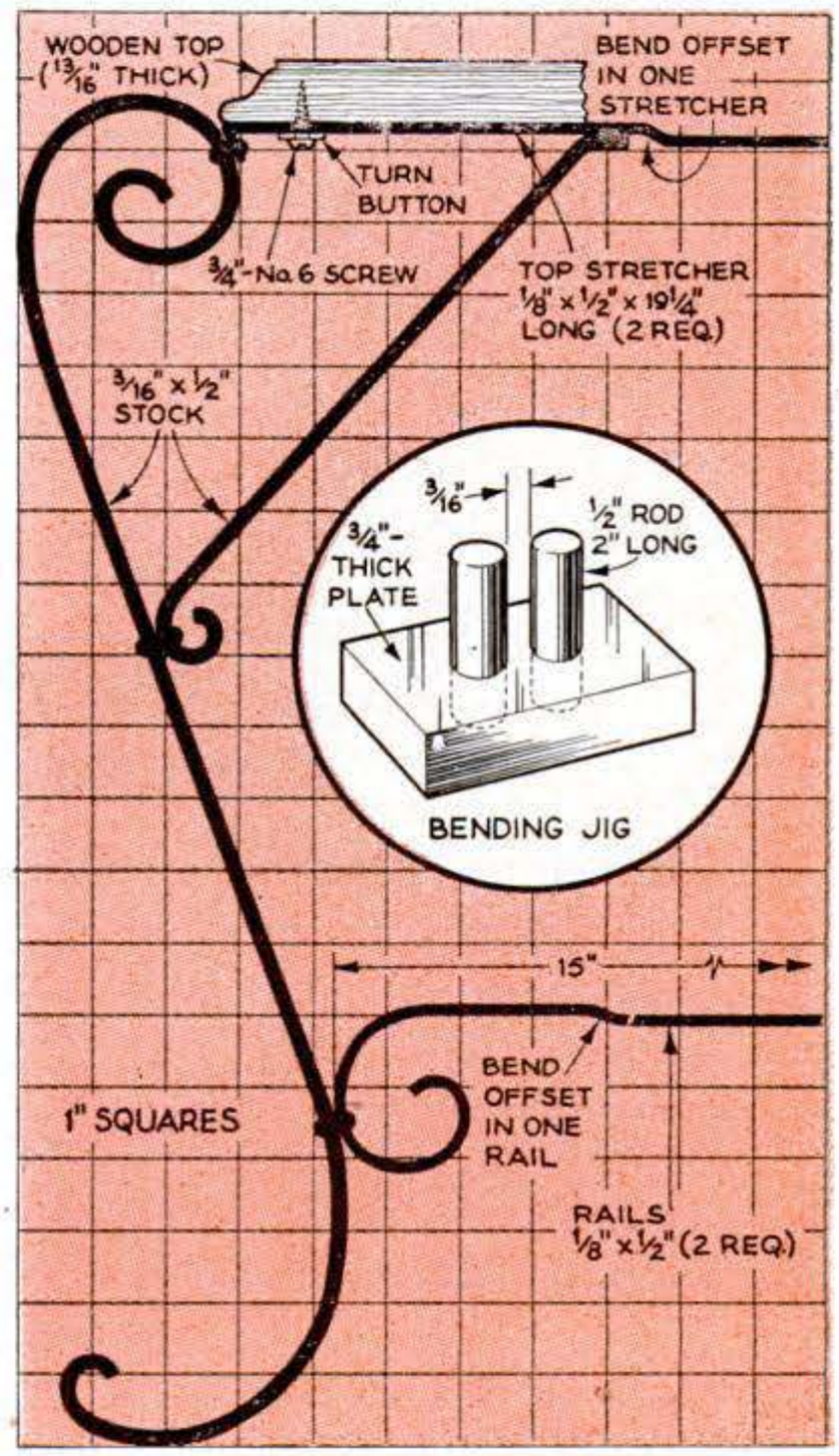
ABOUT 20′ of strap iron, a fistful of rivets, and a wooden top can easily be parlayed into this handsome wrought-iron table. Almost any homemaker will find several uses for it.

The stretchers and rails can be made of lighter material than the legs, or you can use 3/16″-by-½″ stock throughout. This can be shaped cold in a bending jig made as shown in the drawing. Insert the stock between the rods just enough to get a bite, and bend it around either rod. For large-radius curves, bend only a little, take a new bite, and bend farther. Check your bends against a full-size pattern laid out from the squared drawing.

Mark off the rivet holes carefully to insure correct assembly. Two legs and their crossmembers can be put together as a unit. But be sure to leave one end of the rail and stretcher of the second unit unriveted until the two are put together.

The top can be either round or octagonal. The solid-walnut top shown was given a shaped edge and a dull varnish finish.

For easy folding, four clips or turn buttons are screwed under the top so they may be rotated to engage the stretchers. Or you can screw the top directly on, for a rigid table.—*J. I. Sowers, Miami, Fla.*



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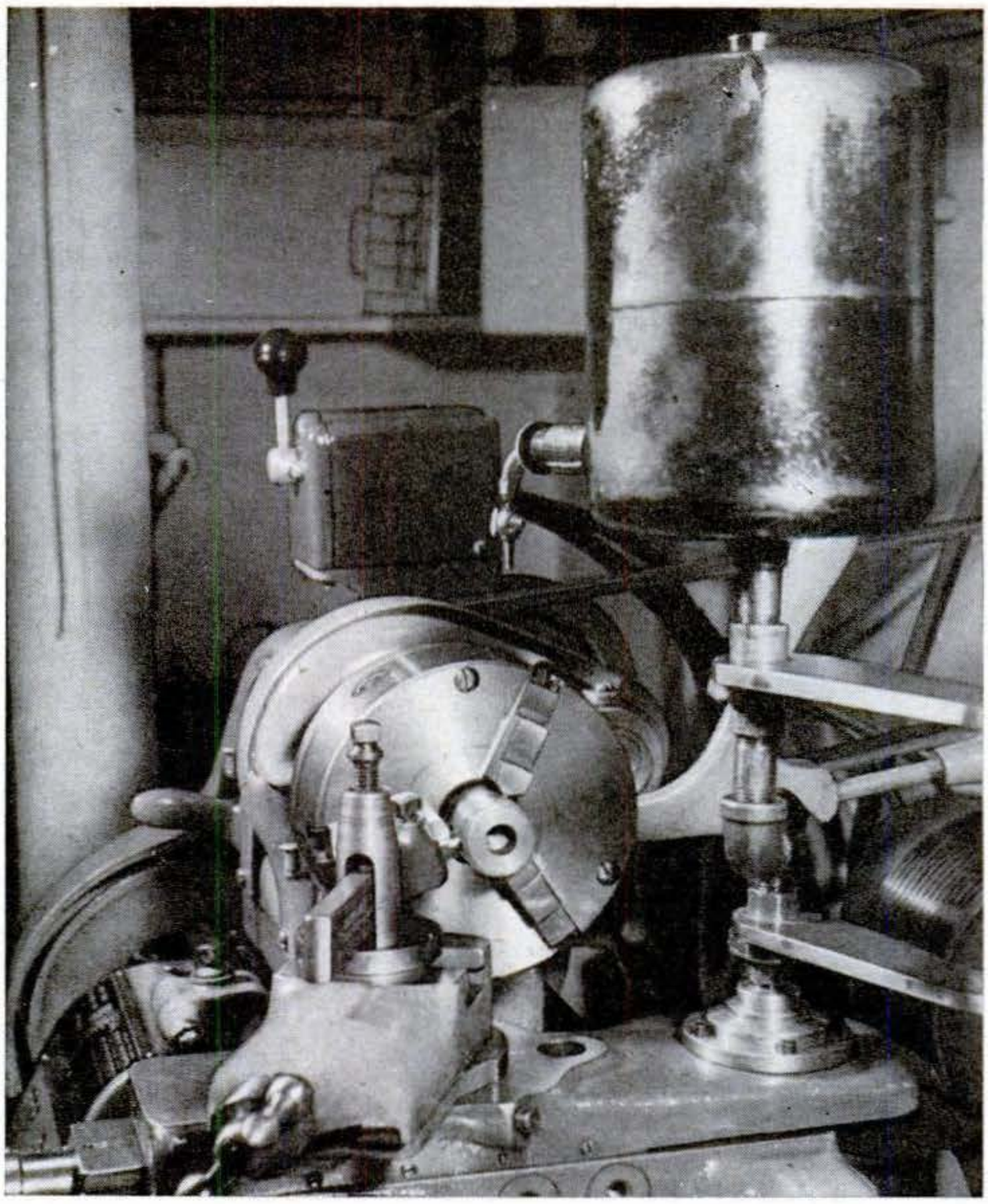
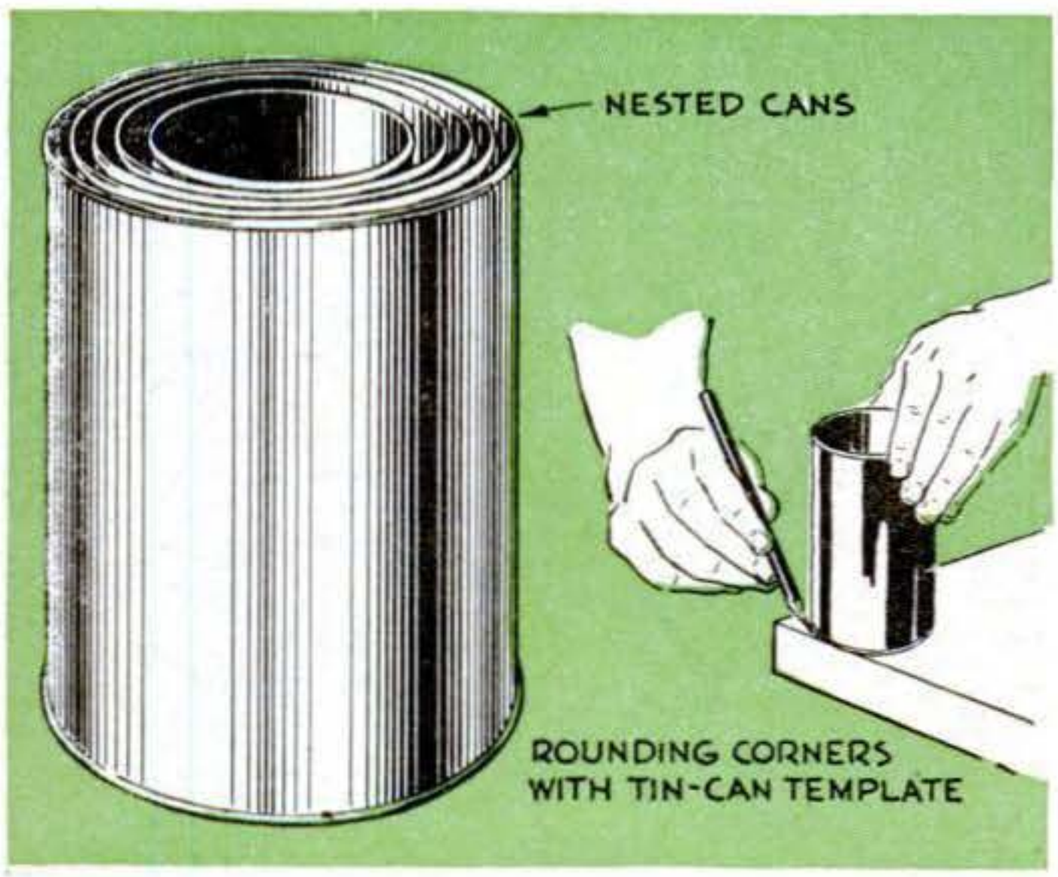
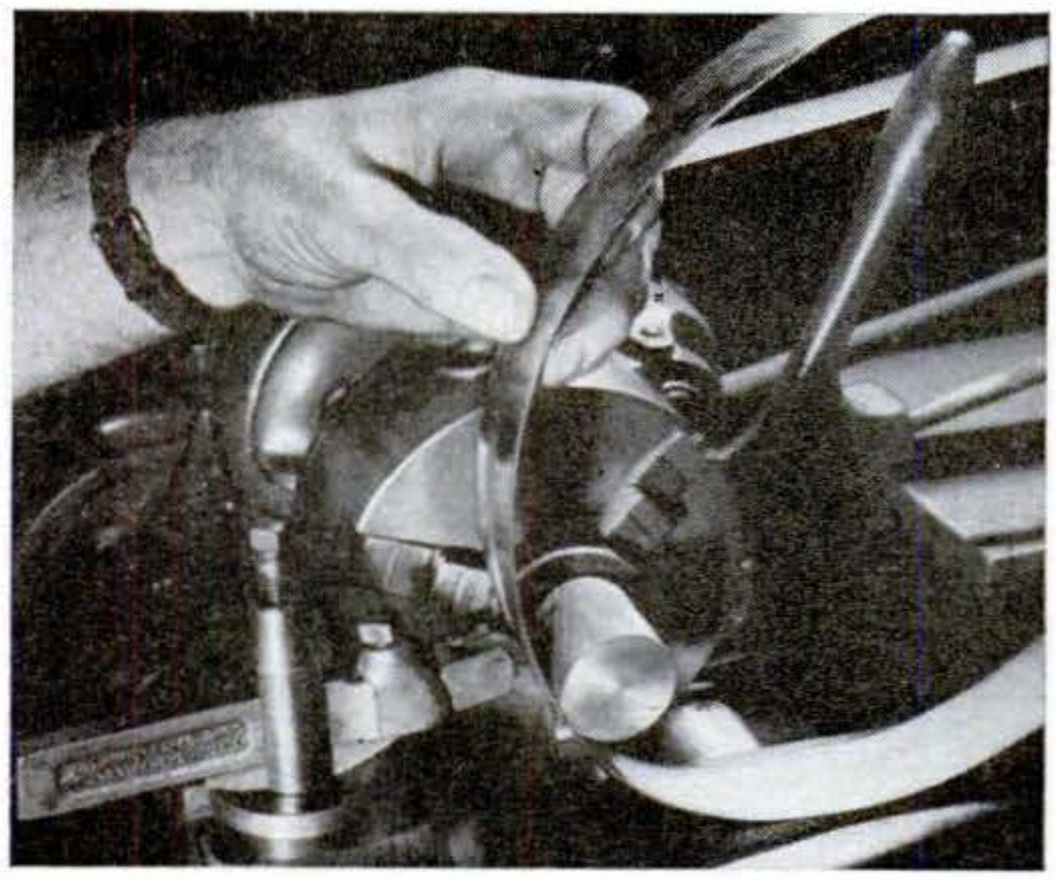
NEW Shop Ideas



Oil Drip Feeder. Once it is set up on the back end of the cross slide, this gravity-feed cutting-oil tank will move with the cutting tool and keep it and the work bathed in coolant or cutting oil. The tank, an old oil filter case, swivels freely on a combination of two unions and an elbow connected by ¼" pipe. The unions are tightened to lock the tank. A ¼" pipe flange, used as a base, is screwed to the cross-slide cover. The gas-cock drip feeder can be adjusted for light or heavy flow.—*Joseph Tracy, New York City.*



Tin-Can Gauge Measures Radius. Tin cans come in many sizes. Save an assortment and nest them as shown, marking each with its size. Use them to find the radius of an inside or outside corner. They are also useful for rounding the corner where two board edges or lines meet at right angles; just push the can up to the edges and draw in the radius.—*George Kapitan, New York City.*



How to Knurl Bands. Decorative metal bands can be knurled by feeding them between a knurling wheel and a heavy rod chucked in the lathe. Knurl the backing rod to keep the work from slipping under pressure of the knurling wheel. Set the lathe for lowest back-geared spindle speed and guide the band with one hand while the other forces the cross feed forward.—*Floyd McGuckin, Ridgewood, N. J.*

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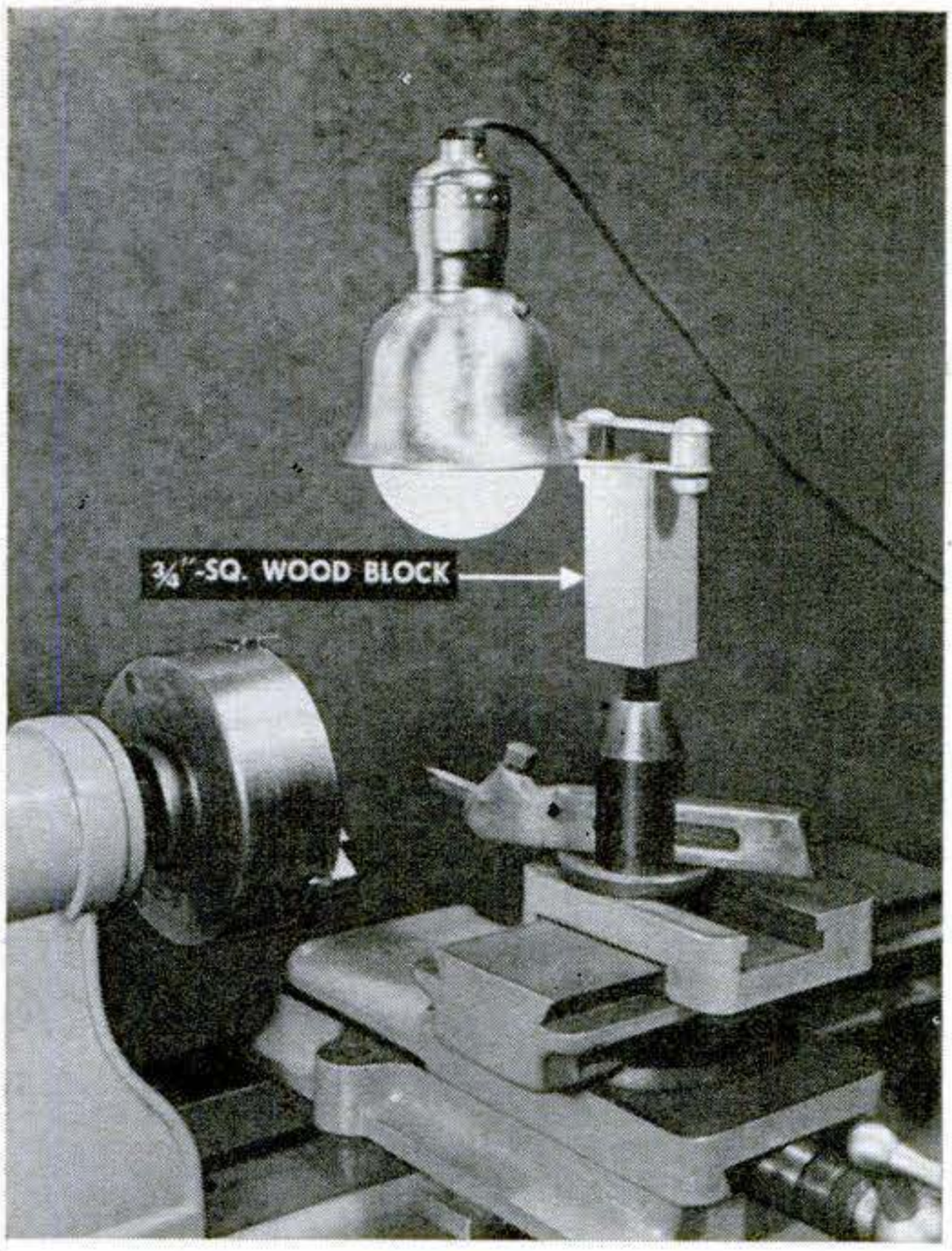
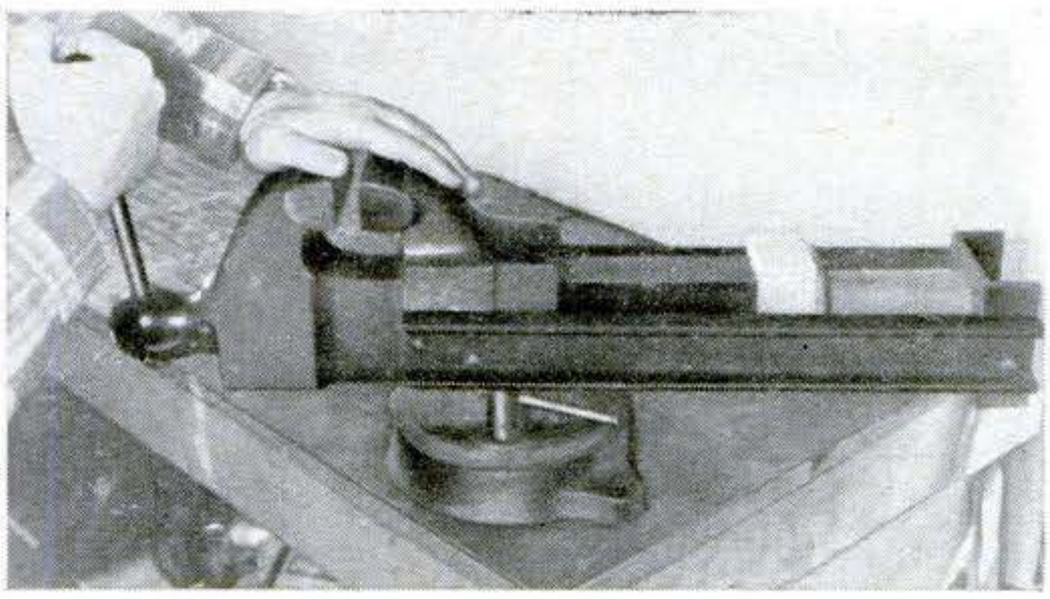


Lathe Lamp Moves with Tool Bit. This auxiliary lathe lamp rides the tool post and follows the cutting action along the length of the work. It is screwed to a wood block drilled to fit easily over the tool-post tightening bolt. When changing bits, it is lifted off and set aside.

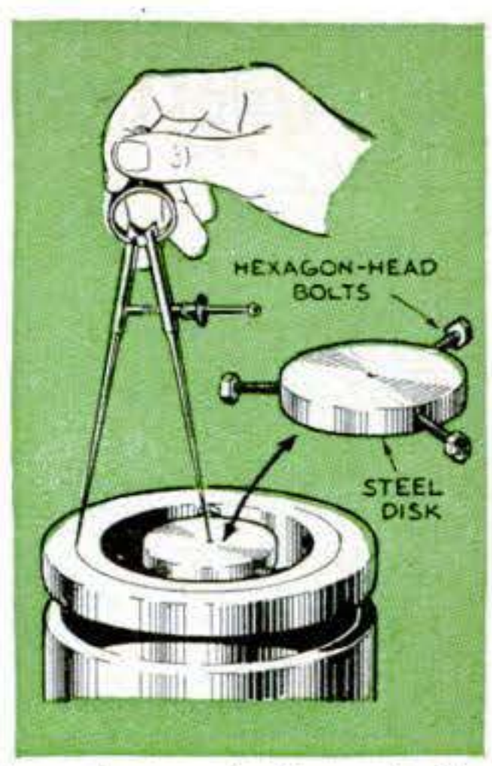


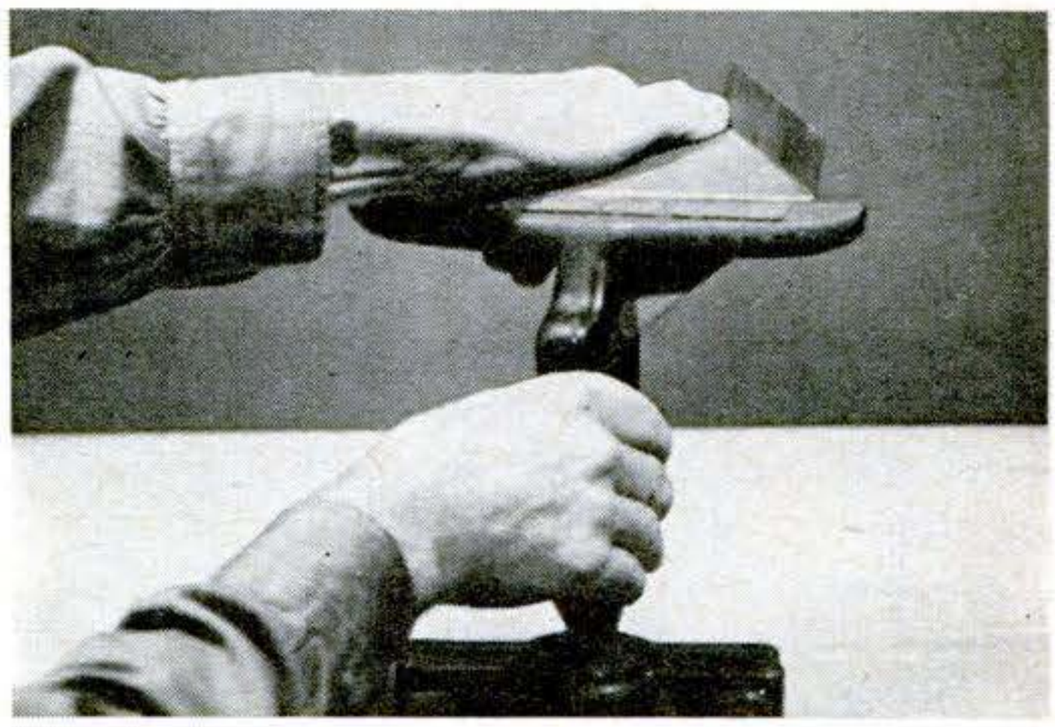
Vise Doubles as Press. For the price of a few pieces of steel channel you can convert a vise into a hand press, and still use the vise as a vise.

Bolt two 18″ lengths of channel to the sides of the vise as shown and join the ends with the vise body. Insert shims if this piece is slightly undersize. Some vises have the manufacturer's name cast in the sides; this can be sliced off with a cold chisel and the sides smoothed with a file.

Short work should be backed up with wood blocks to bring it within the range of the vise ram.—*Elbert Robberson, Port Washington, N. Y.*

Mechanical Spider Centers Dividers. Layout work around a bored hole or a cored casting can really be difficult—you can't support the dividers in a hole. This mechanical spider punched in dead center will support the divider leg and accurately center it in the bore. Adjusting the three bolts shifts the center to suit the layout. An extra set of long bolts will hold the spider in large openings.—*F. Shelford, Los Angeles, Calif.*





Use Saw Vise as Bending Brake. A saw vise, which has longer jaws than the ordinary bench vise, can be put to use in bending thin sheet metal. It will handle practically any home-shop bending job.

Tape Sets Drill and Tap Depth. Running a tap to the bottom of a blind hole invariably spoils the work or breaks the tap. Masking tape wrapped around the drill will show when you've reached the desired depth. Around the tap it will show when you're nearing bottom. Distance should be measured from the beginning of the flutes rather than the point when setting the depth for drilling.

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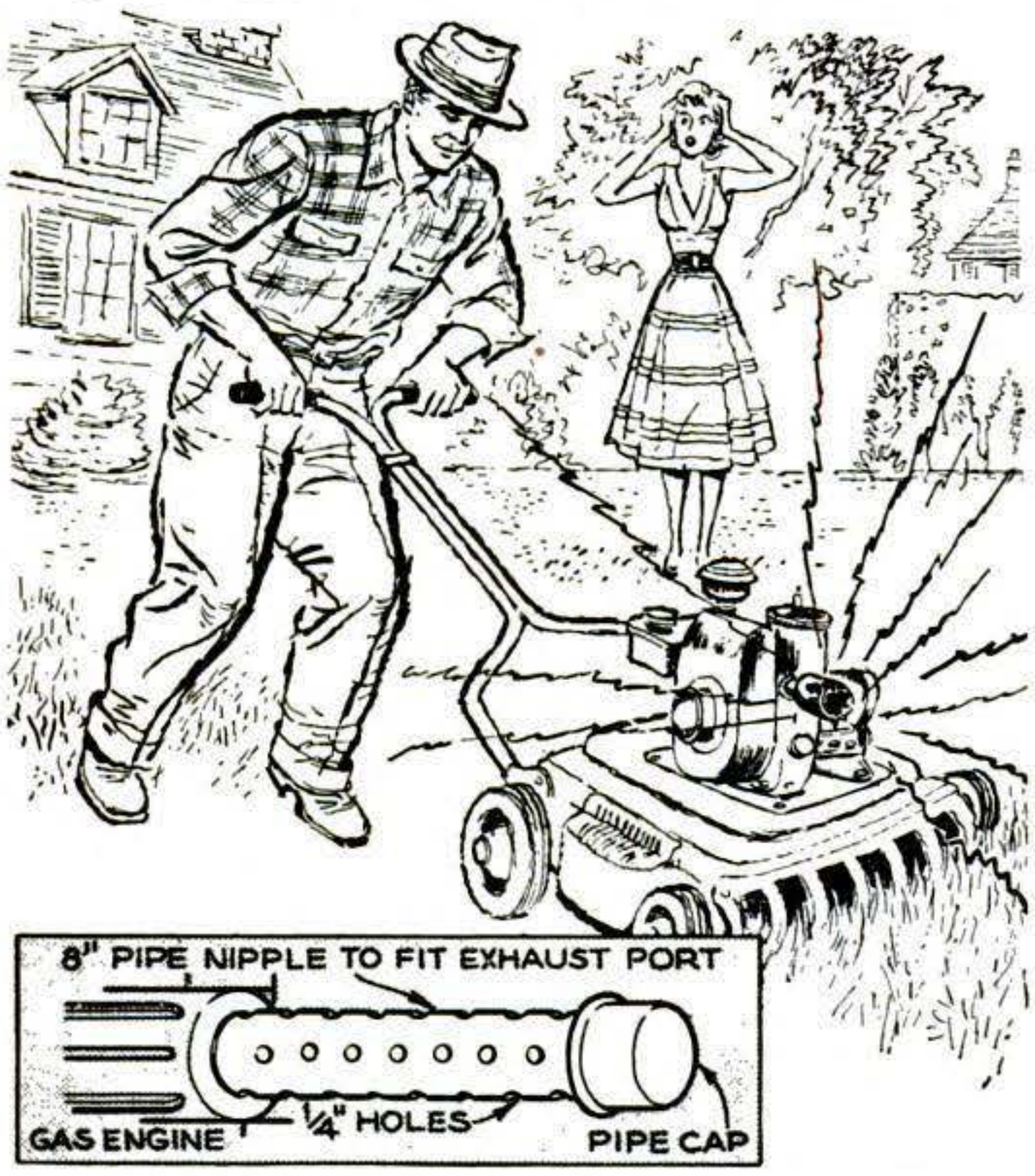
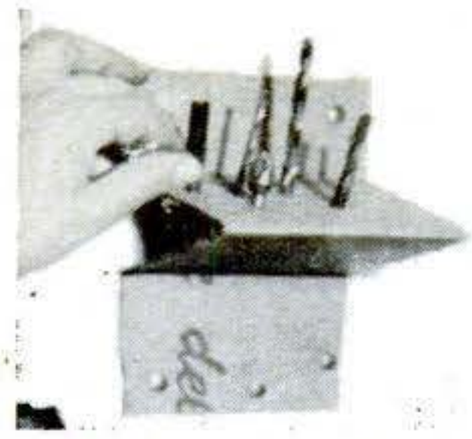
Pipe Nipple Muffles Mower



If a burned-out or rusted muffler is making your power mower sound like a string of firecrackers, you can reduce the racket considerably with a pipe nipple about 8" long, drilled and capped as shown. Four rows of ¼" holes spaced about 1" apart will permit the exhaust gases to discharge easily and less noisily.

Bent Cardboard Holds Drills

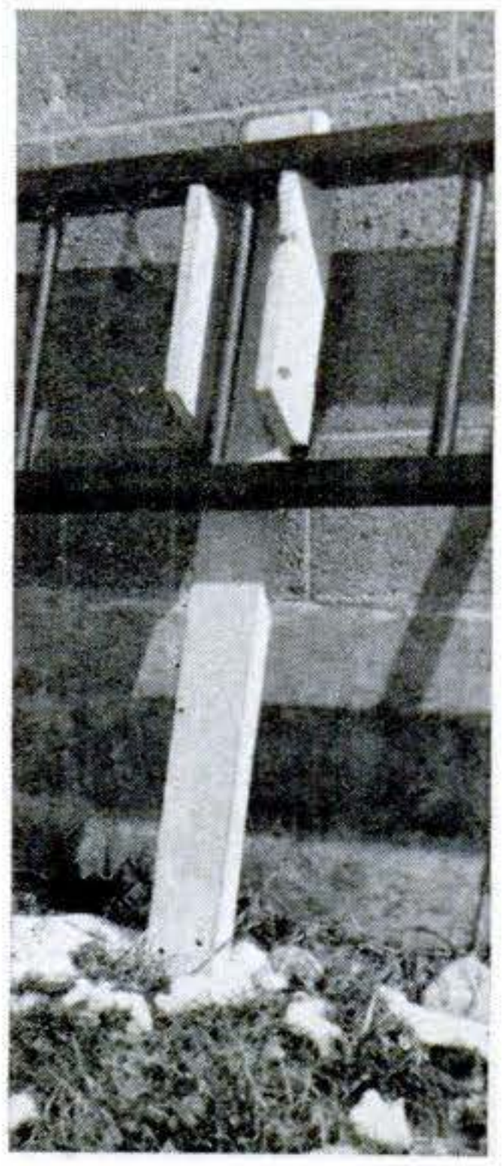


If you need a drill rack in a hurry, use a piece of cardboard. Fold it in the middle, bend short flanges on the ends, punch holes for the drills in the top of the center fold, and thumbtack to the wall.—*Glen F. Stillwell, Manhattan Beach, California.*

Rack Will Protect Your Ladder

Your ladder will last longer—and be out of your way—if you store it off the ground.

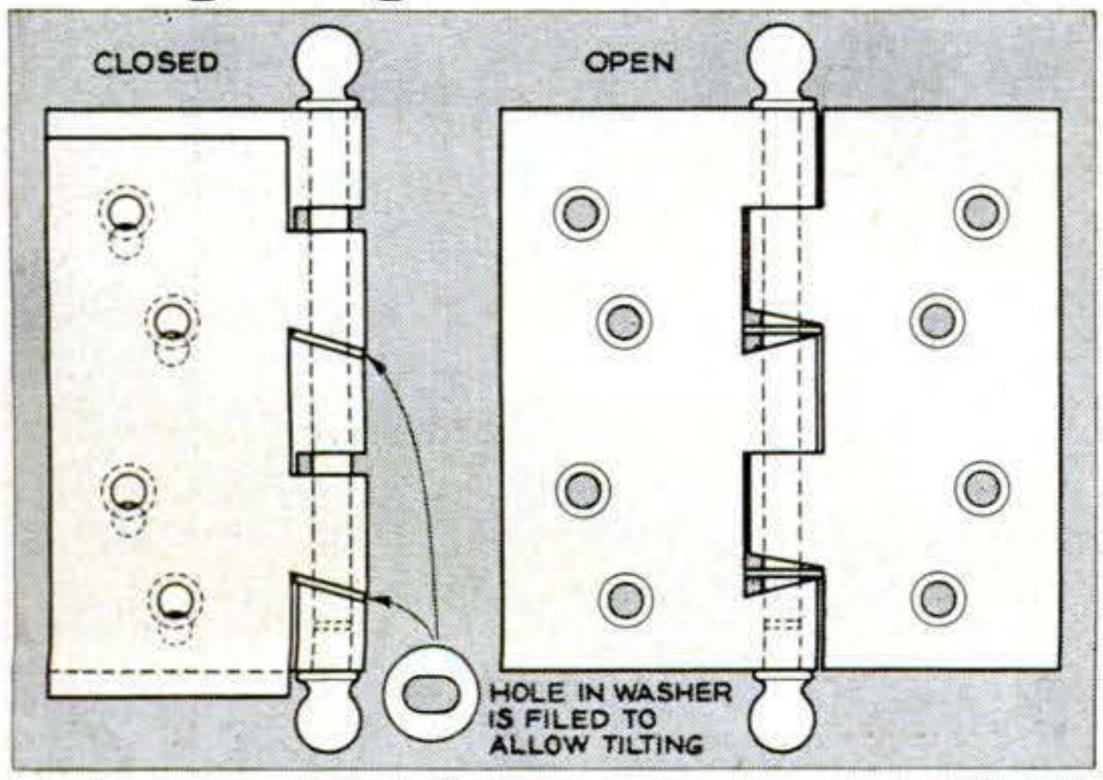
The ceiling rack above, made by Raymond P. Ghelardi, Cambridge, Mass., has rollers—1" pipe mounted on dowels—at either end so the ladder slides in or out easily. For storage against a wall, Russel S. Dart of Middle Haddam, Conn., uses a stand of 4' two-by-fours with short boards nailed on. The ladder hooks over the boards.



Shellac Guards Sash-Cord Knots

Sash-cord ends are less likely to fray or slip their knots if you dip them in a can of shellac after tying. The shellac dries quickly enough to allow application of several coats. —*Lewis Booker, Louisville, Ky.*

Tilting Hinges Will Make Screen Door Close Itself



A screen door will gently close itself without a spring—or stay obligingly open part way for awhile—if you use the trick of tilting hinges. The door's own weight then makes it close. Stock hinges are converted by cutting away the two bearing surfaces as shown.

A slope of 1 in 1¾ is best for light screen doors, but heavy solid doors may need only 1 in 3. To retain oil at the bearing surfaces, washers are needed. Their holes should be filed oval to allow tilting around the pin.—*Edward E. Thorp, Montclair, N. J.*

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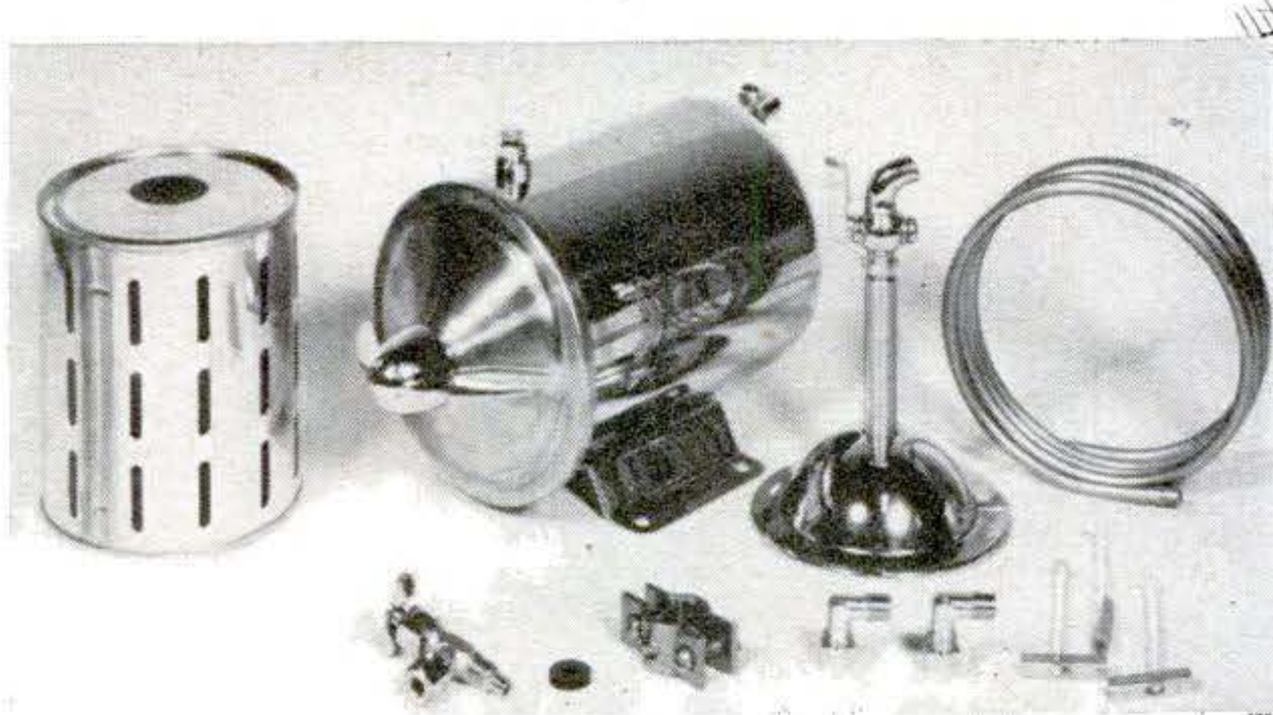
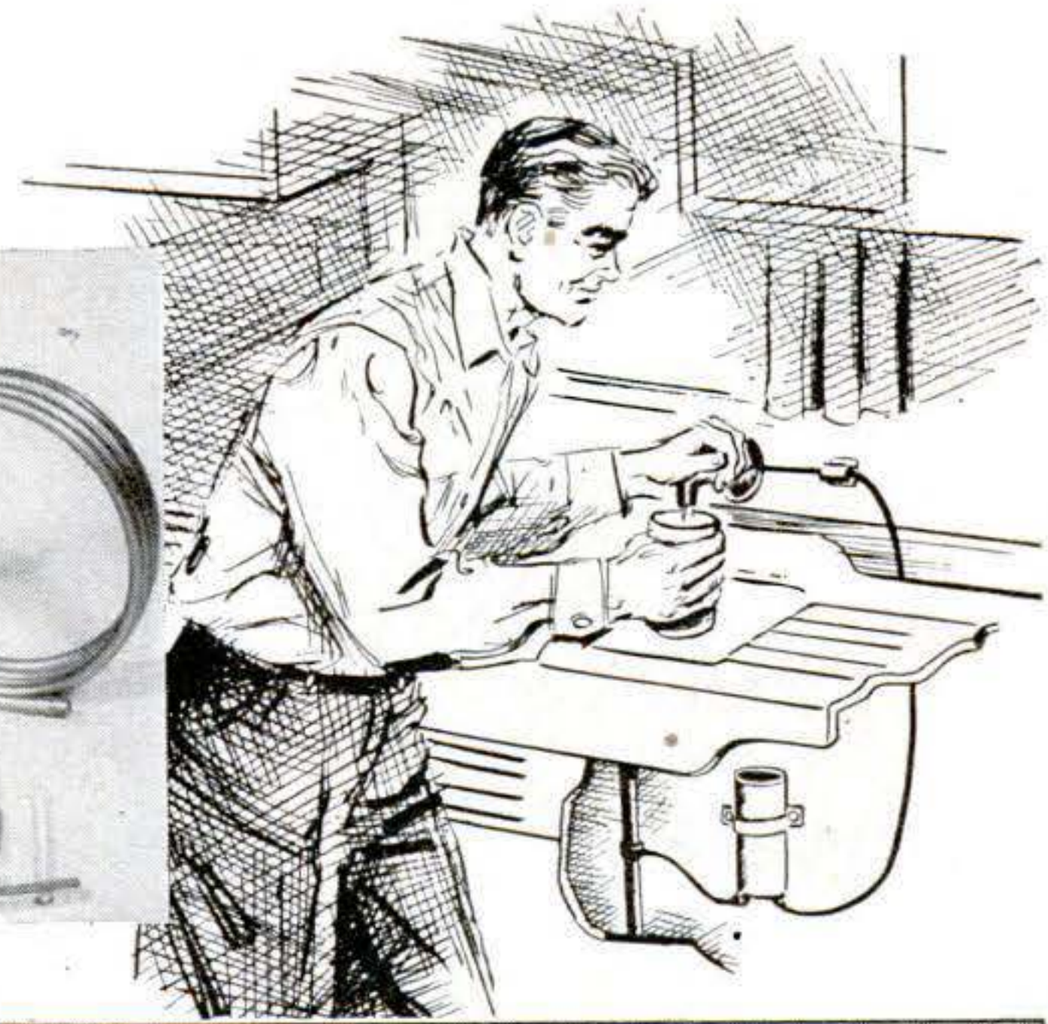
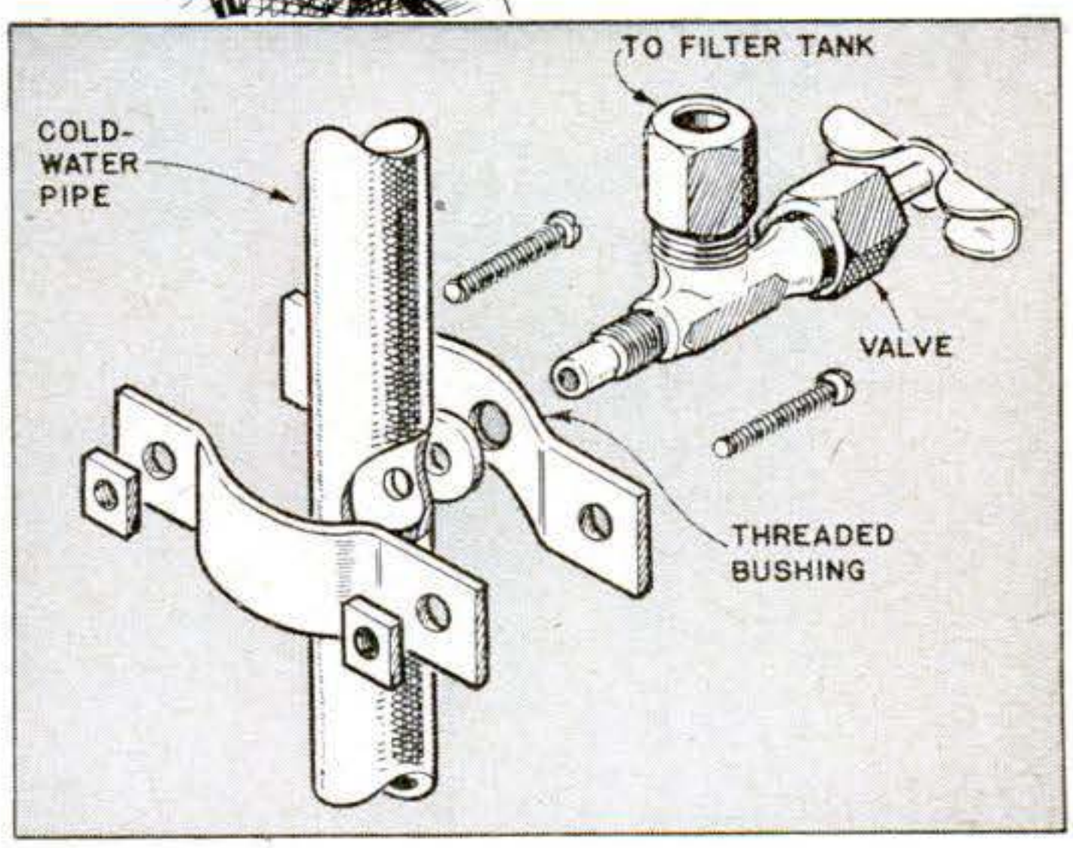
Kit Hooks Water Purifier to Your Kitchen Sink

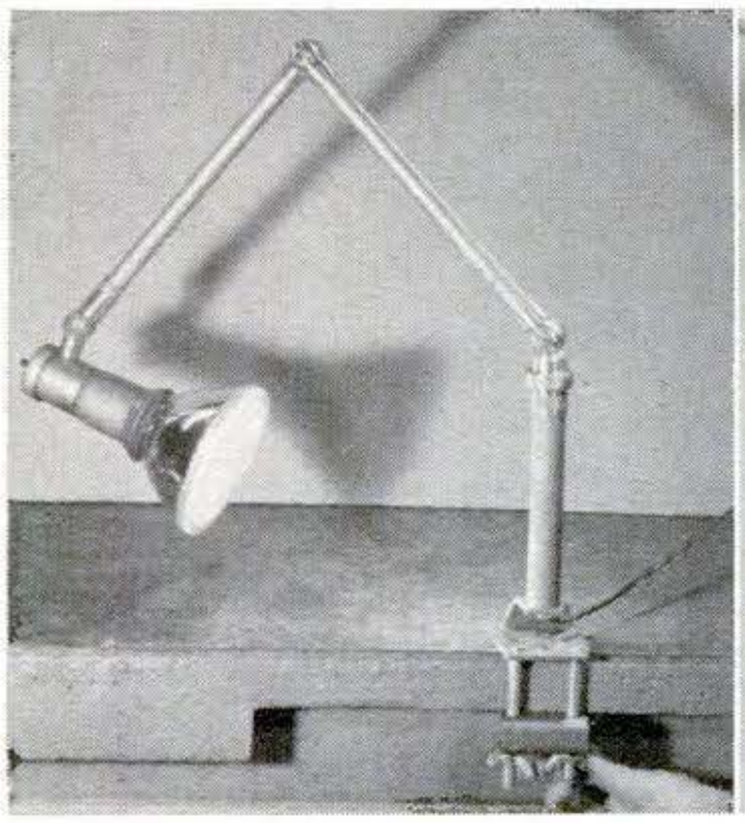


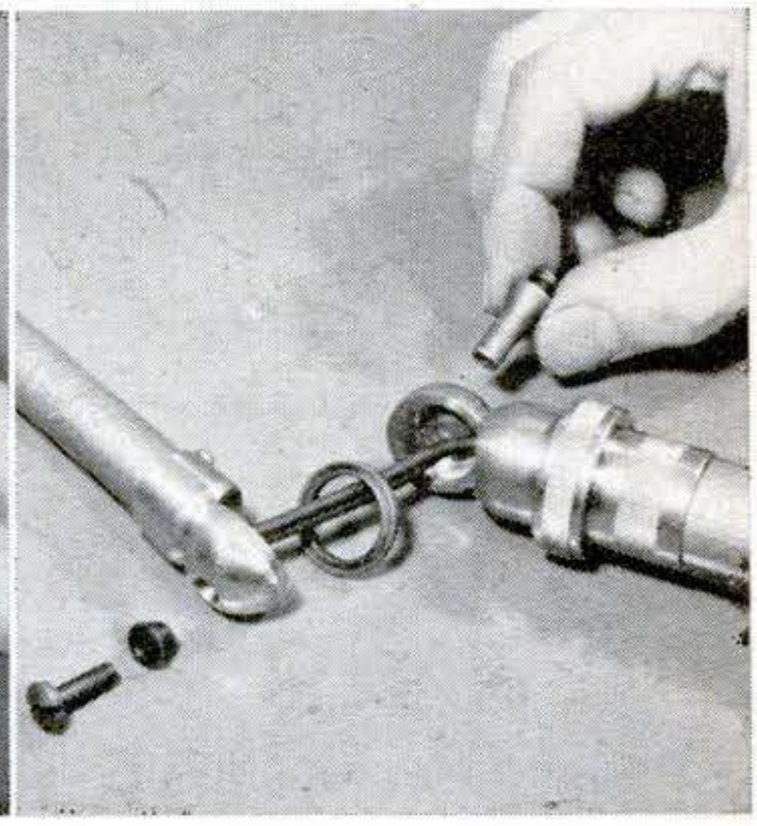


You can have purified drinking water on tap by drilling a small hole in the cold-water inlet to your kitchen sink and hooking on this filter tank. The kit includes all pipe, fittings and connectors, plus a special spigot that can be mounted anywhere near the sink. After the hole is drilled in the pipe, a threaded bushing is clamped over it and a valve screwed into the bushing (right). Then ¼″ tubing is run from the valve to the tank and from the tank to the spigot. The electrochemical purifier is said to remove bad odor or taste, and 99 percent of all bacteria. *Wolfer Corp., 3723 Wilshire Blvd., Los Angeles.*



Sealed Shop Lamp Gives Brighter Light, Can't Corrode





WITH this sealed-reflector shop lamp you'll get more light and less dirt. The swivel-joint lamp, made especially for use around power tools, is said to eliminate the grease and grime that collect on ordinary lamps, and rob up to half their output. It comes in three models with various arm arrangements, can be clamped or screw-mounted and takes either a reflector-flood for broad light or a reflector-spot for close, pinpoint work. Neoprene-rubber sleeves (center above) protect the swivel joints from oil vapors and moisture. Also available is a kit of different-length arms, connectors (right) and reflector hoods, from which you can assemble a variety of conventional lamps. *Robboy Electric Mfg. Co., 2062 E. 70 St., Cleveland.*

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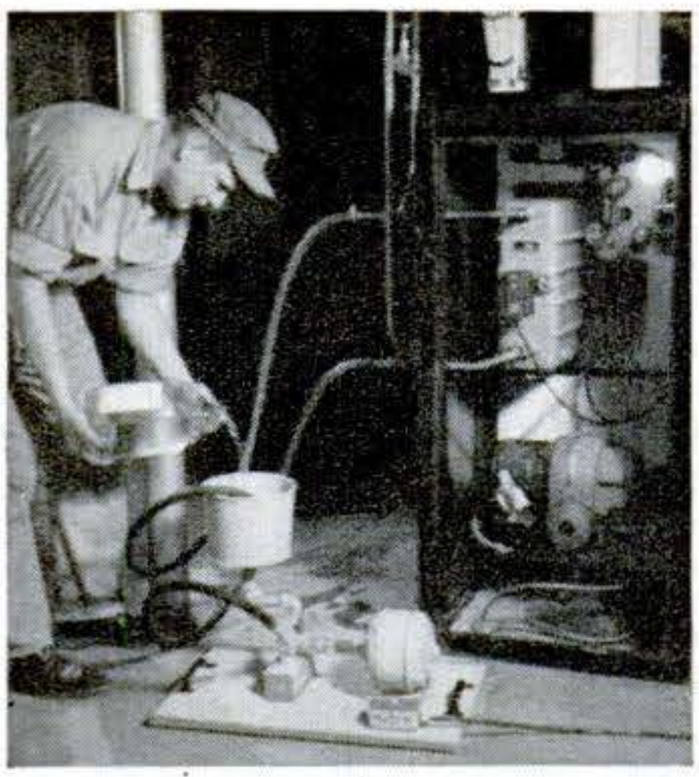
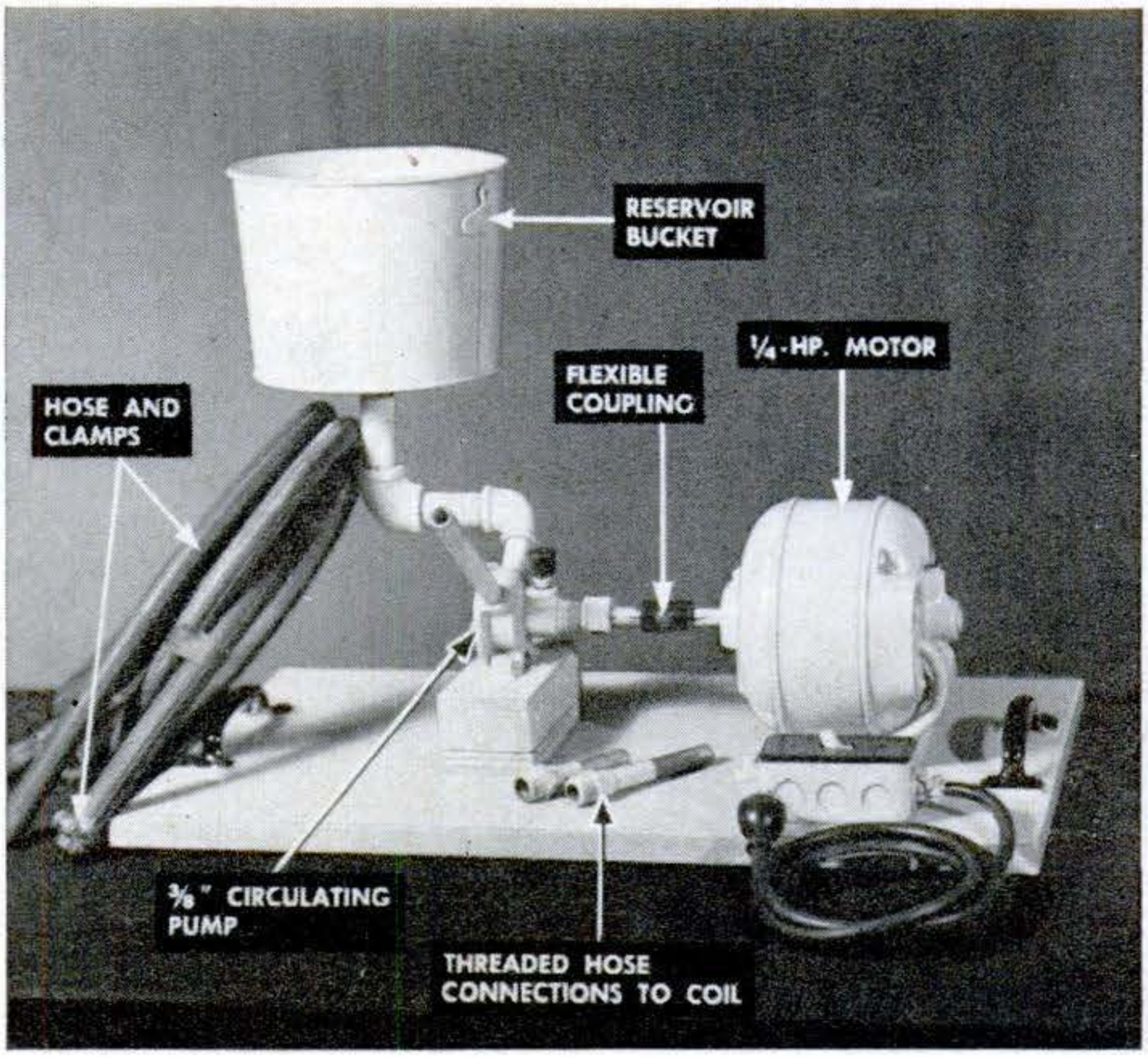




Pump Outfit Cleans Heater Coils

Coils in a tankless water heater can get hardening of the arteries. Lime in hard water builds up inside, cutting both their capacity and heating qualities.

The outfit shown here will probably see service every year if your town has hard water. It circulates a commercial solvent to dissolve the lime.

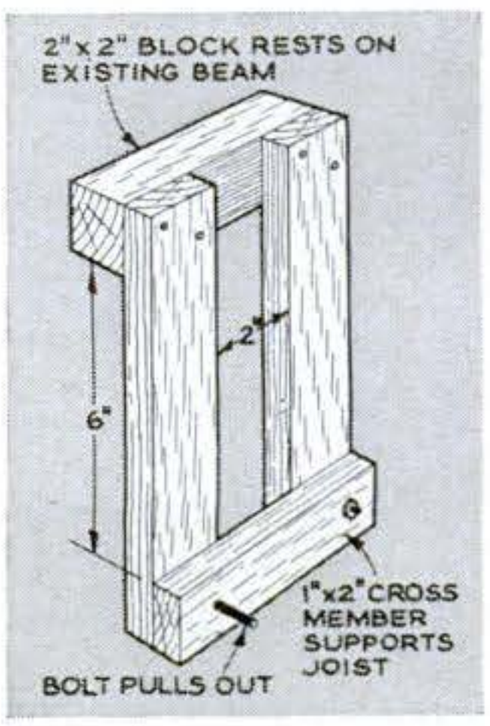
You use it by shutting off the oil burner and cold-water supply, draining the coils and connecting the pump to the lower end. Hose is then run from the upper end of the coil to the reservoir bucket. Tees can be fitted to the pipes to make the annual hookup easier. A gallon of solvent (about $3 at plumbing supply houses) is poured into the bucket, pumped into the coil and allowed to stand about 15 minutes. The solvent is then circulated until it flows from the return hose in a "full-pipe" stream. The hoses can be switched occasionally to reverse the flow of solvent for a more thorough cleaning.

The solvent is then discarded and water and a little detergent circulated through the coil.

Remove the pump connections, hook up and turn on the water and run the burner for about 15 minutes while the heated water runs out a faucet, flushing away the last trace of solvent.—*Frank V. Kopec, Wallington, N. J.*

Simple Holder Makes Nailing Joist a One-Man Job

In such projects as building a porch or arbor, supporting and nailing the cross members becomes a one-man job with a pair of these holders. With the ends of the beam resting in the holders, you can concentrate on nailing it in place. When the nails have been driven, pull out the bolts to free the holders. The dimensions shown are suited to two-by-sixes.—*W. G. Waggoner, Sacramento, Calif.*



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Mate to CAPT. EDDIE RICKENBACKER'S 1917 Engine

STILL HITS 100 M.P.H. WITH CHAMPIONS

Capt. Eddie Rickenbacker, Pres. & Gen'l Mgr. of Eastern Air Lines, flew a Hisso-powered Spad as our "Ace of Aces" in World War I. Today, a mate to this 36-year-old engine powers speedboat "It's A Wonder".

The colorful career in war and peace of this historic engine—oldest registered with the American Power Boat Association—proves you can't beat proper maintenance. Says Geo. N. Davis of Vine Grove, Ky., owner of "It's A Wonder": "She's as sweet and sassy now as she ever was. And I aim to keep her that way with Champion Spark Plugs. The years don't mean a thing when you keep Champions in a good engine!"

Try a set of dependable Champions soon. You'll never go back to ordinary spark plugs!

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

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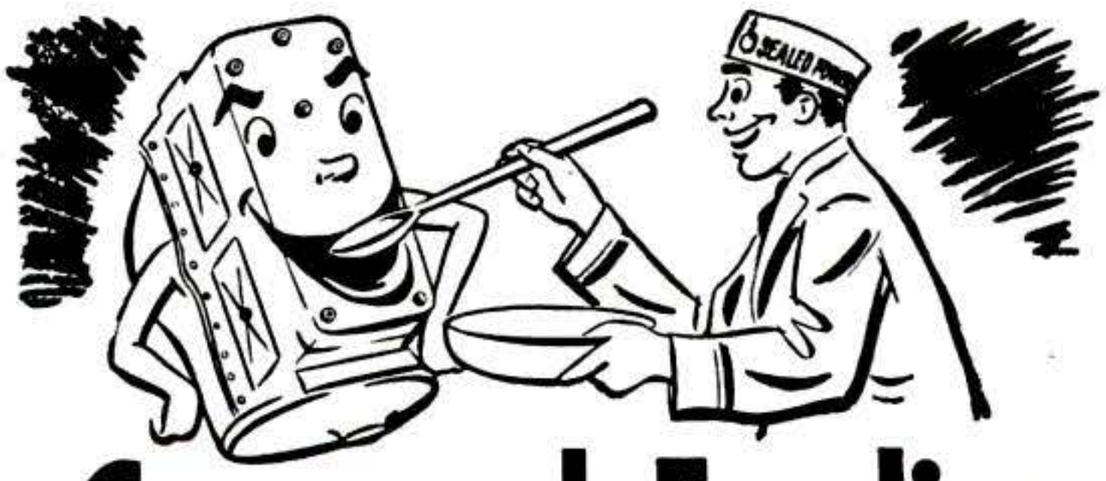
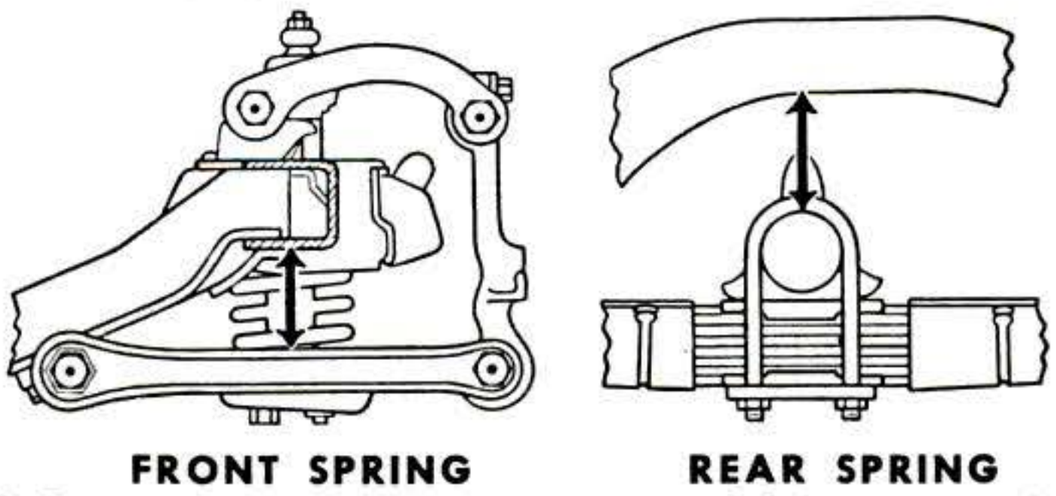


Care and Feeding of Engines BY S. P. CORP

HARD STEERING

Hard steering may be caused by (1) improper lubrication, (2) uneven tire pressure, (3) brakes needing adjustment, (4) bent steering knuckle, (5) improper camber or caster, (6) frame bent or out of line, or (7) a sagged spring. Points 1, 3, 4, 5, and 6 will need the help of your dealer. Here is how to check for sagging springs:

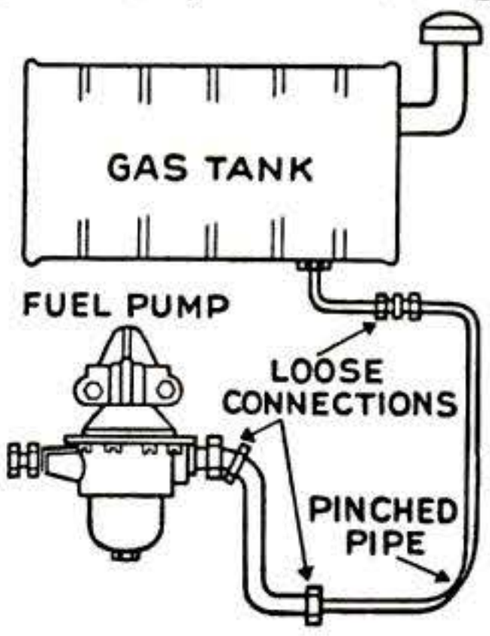


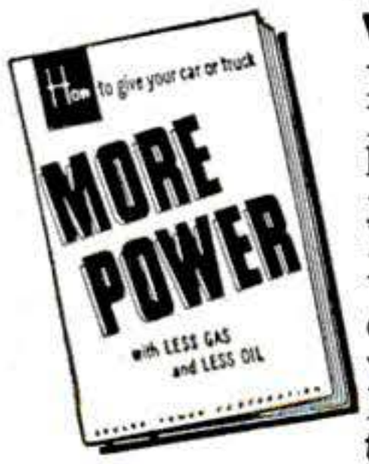
FRONT SPRING REAR SPRING

Inflate all tires to correct pressure. Make sure nothing in car or trunk causes extra weight on one side. Then check height of each front spring from top of lower control arm to bottom of frame; these should be equal. Then check against a new car, and replace springs if sagged. Check rear springs from bottom of frame to top of rear axle; a difference in readings should be corrected by replacing springs.

HOW TO CHECK FUEL PUMP

One cause of power failure can be lack of fuel due to a leaky or restricted line. Check this by disconnecting fuel line at carburetor, connecting rubber tube to end of line and placing other end of tube in a quart measure. Have someone start engine and run it at idle speed for 45 seconds—for which there is sufficient gas in carburetor. Pump should deliver one pint or more. If it delivers less, look for a leak in pump or fuel lines, or a restriction between fuel pump and gas tank. *CAUTION: Make test outdoors! Use care with gasoline!*





WRITE FOR FREE BOOKLET

For your free copy of "MORE POWER, Less Gas, Less Oil," a helpful illustrated manual of car care, just write a card to Sealed Power, Dept. H-9, Muskegon, Mich. And for the finest piston rings made, insist on Sealed Power KromeX Ring Sets, with the famous MD-50 Steel Oil Ring, best for oil control even in tapered and out-of-round bores.

Meet Mr. Guided Missile

[*Continued from page 144*]

There was the dramatic incident of the first flight test of the first Regulus. It was a failure and resulted in a total loss of the "bird." A lot of people had seen it fall. Afraid that security precautions would be stripped when no pilot was found at the scene of the crash, an officer quickly rigged a Navy pilot in flight clothes and put a popped parachute in his arms. He was planted in a field of alfalfa, ready to explain to one and all that he had bailed out when the engine of his plane had failed.

The Case of the Stubborn Cow

Another time a stubborn (or, perhaps, subversive, adds Palley) cow refused to budge from the middle of the runway. A pilot made low passes, but the cow ignored them. A jeep did no better. Finally an enterprising sailor rigged up a persuader from a couple of flashlight batteries and some wire. Bossie left in such a cloud of dust that a photo plane flying overhead concluded that a Regulus had been launched.

This reminiscing was mostly for my benefit. During his short visits home, Palley is far too busy with his family and hobbies to think much about the missile. Golf (he plays in the middle 70s) and bridge have had to go pretty much by the board. Their place has been taken by building furniture and refinishing antiques, which keep him around the house.

He also builds model cars and airplanes. Four-and-a-half-year-old John already is an avid airplane-model fan.

Although Palley is following the history of aviation in his models, there is a difference. Some of the models young John plays with may be studies for guided missiles to come. END

The Changing Times

INDIAN chief introducing himself to a paleface visitor: "I am Brave Eagle; this is my son, Fighting Bird, and this is my grandson, Superjet Bomber."—*L & N Magazine.*

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Now... Flash Pictures right on the button

Get every picture, always in synch, with new Kodak B-C Flasholder . . .

only $10.40 (including Flashguard)

Dependable flash—B-C (battery-condenser) is the most dependable flash system.

Maximum flash power every shot—Built-in condenser stores battery power, fires lamp with full surge at right instant.

Extra-long battery use—B-C extends useful battery life. Takes 22.5 volt battery (extra).

Multiple-flash connection—Accepts extension units.

Easily read exposure guide—On back of reflector.

Comfortable hand grip—Strong, light body has improved bulb socket, positive ejector.

Quickly adjustable bracket—Fastens to camera tripod socket. Adapts to camera size. Cushioned pad holds camera firmly.

Positive flash operation—Electrical contacts are designed for maximum current flow.

"Loss-proof" cord — It's attached permanently.

Inexpensive midget lamps—SM, SF, No. 5 or 25.

Also available in Standard model without B-C. Uses "C" batteries; accepts B-C Flashpack (see below left). $8.25.

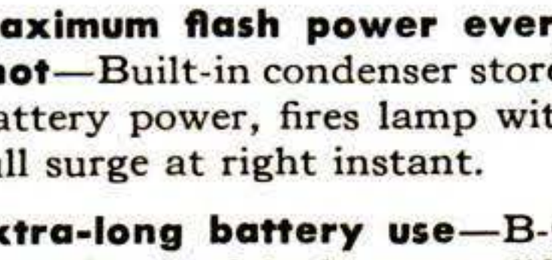
50% more illumination and greater camera range with new Lumaclad reflector

Pictures at greater distances—Extra-bright, mirror-surface reflector makes correct exposure easier to obtain.

Even illumination—Extra-deep, tarnish-proof, dent-proof, Tenite reflector assures even lighting without "hot spots."

See your Kodak dealer for wide choice of inexpensive Flasholders for most Kodak and Brownie Cameras.

Prices are subject to change without notice

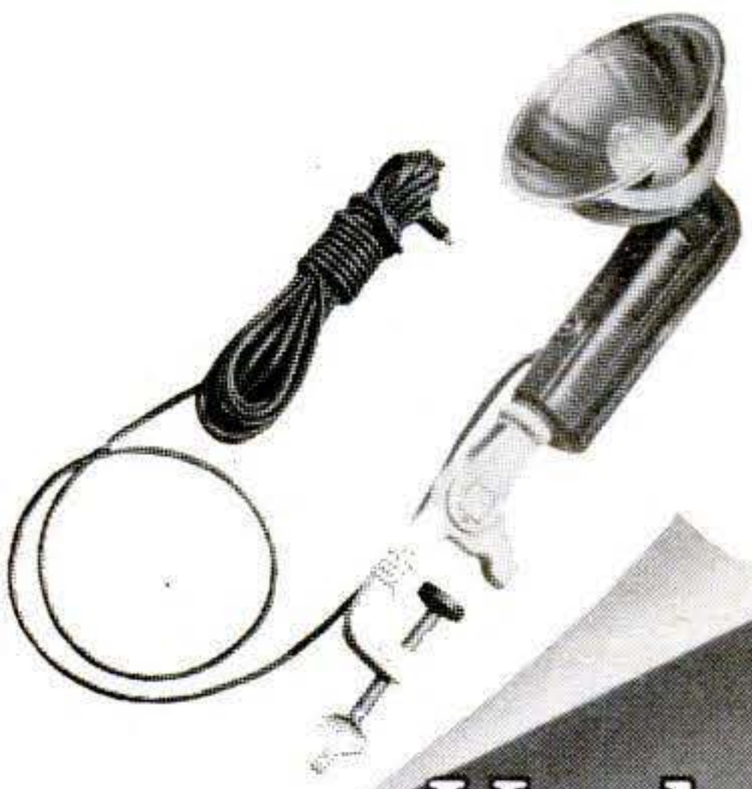


Convert old flash unit to B-C

Kodak B-C Flashpack replaces two "C" batteries (end-to-end type). $2.95 (battery extra).

Multiple lighting easy *(right)*

New Kodak Flasholder Extension Unit, Model 1, with Lumaclad reflector has 20-foot cord and connector, exposure table, bulb ejector, Flashguard. Use up to 2 units with Kodak Flasholders for special lighting. $11.



Eastman Kodak Company, Rochester 4, N. Y.

Kodak
TRADE-MARK

[*Continued from page 159*]

live and work in Greater Chicago. The rest are widely scattered.

There is a picturesque and true story that Armour Tech began with a sermon. Rev. Frank Gunsaulus, noted for oratory sprinkled with five-syllable words, preached one morning in the Nineties on what he would do about young Chicago's education if he had a million dollars. After the sermon, Philip D. Armour, who had been greatly moved by the vision, stepped up and offered him the means to practice what he preached.

Thus Armour Tech came into being, and in the course of years the Armours' contributions to it greatly exceeded the founding gift.

Lewis Brought a $2,000,000 Dowry

Lewis Institute, the other parent of Illinois Tech, was also established in the Nineties. It sprang from the dreams of a frail young man who had pushed westward from a little town in Connecticut and made a fortune in Midwestern real estate before he died, in 1877. It was 1895 before the money he left had grown sufficiently to found the technical school that the terms of his will dictated.

When Armour Tech and Lewis Institute merged to form Illinois Tech, Lewis brought a dowry of around $2,000,000 to form a common endowment with Armour's remaining few thousands. This left a lingering suspicion in the minds of many stalwart Lewis alumni that the union had been largely a marriage of convenience. However, they cannot help taking pride in the spectacular growth of the only child. END

The World Today

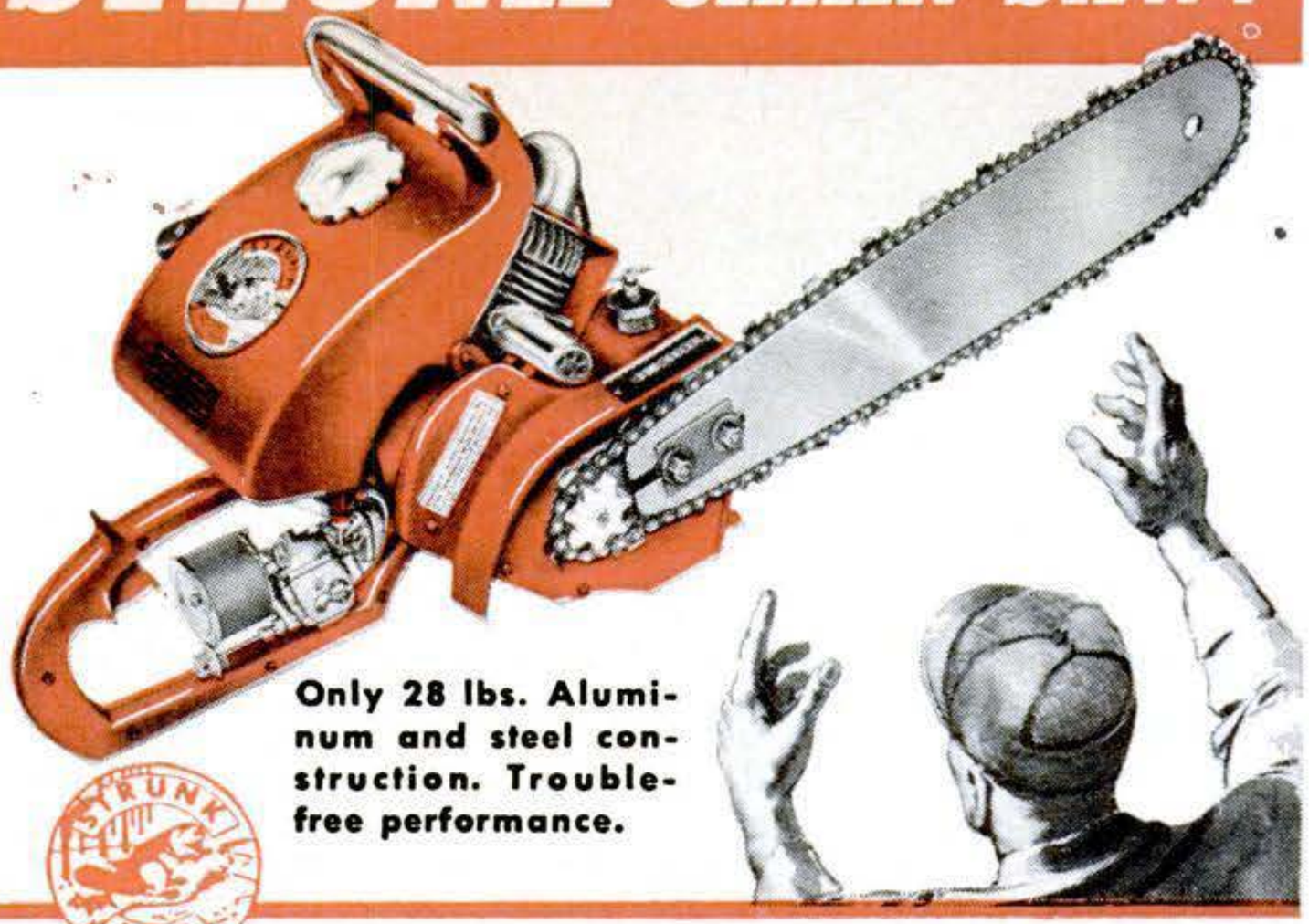
DOUBTFULLY the young mother examined a toy. "Isn't this rather complicated for a small child?" she asked.

The clerk replied, "It's an educational toy, madam, designed to adjust a child to live in the world of today. Any way he puts it together, it's wrong."—*Housewares Review.*

Wait 'til you get your hands on this money-making STRUNK CHAIN SAW!

WAIT 'til you swing this red-and-chrome beauty into cutting position! It's got everything! A rugged 2-cycle engine that starts with just *one* pull on the starter (thanks to a 22,000 volt magneto!) . . . ball and needle bearings throughout . . . and a centrifugal clutch that responds automatically to a single trigger control. You can make money cutting wood (get as high as $17.00 a cord) or adapt the power plant for other uses. See for yourself. Try a Strunk today! Only $239.00 F.O.B.

Write for complete information about the Strunk Chain Saw and the name of your nearest dealer.



Only 28 lbs. Aluminum and steel construction. Trouble-free performance.

STRUNK CHAIN SAWS

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GREATEST VALUE IN THE CHAIN SAW FIELD TODAY . . . AND TOMORROW!

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We "Deep Freeze" Ford Batteries to save you money!

Ford Batteries are made to start your car at temperatures much colder than you may ever know. And that's only one reason why they are your best battery buy—

They're tested to go at 30-below! Ford Batteries are tested to start at temperatures that cold—*and* to stand up in desert heat! They're also shake-tested, dust-tested, cycled from full charge to full discharge 275 times! They must prove they can "take it" *before* being approved for manufacture.

Ford Anti-Freeze will save you money, too!

Ford Permanent Anti-Freeze will last all winter in a properly operating cooling system. It contains a rust inhibitor and exceeds the Bureau of Standards' safety requirements. *Ford Regular Anti-Freeze* gives safe, dependable cold-weather protection to Fords at low cost. Tests prove it gives more anti-rust protection than many similar types.

Keep your Ford all Ford

Genuine Ford Parts are available at all Ford Dealers and the selected independent garages where you see this sign.

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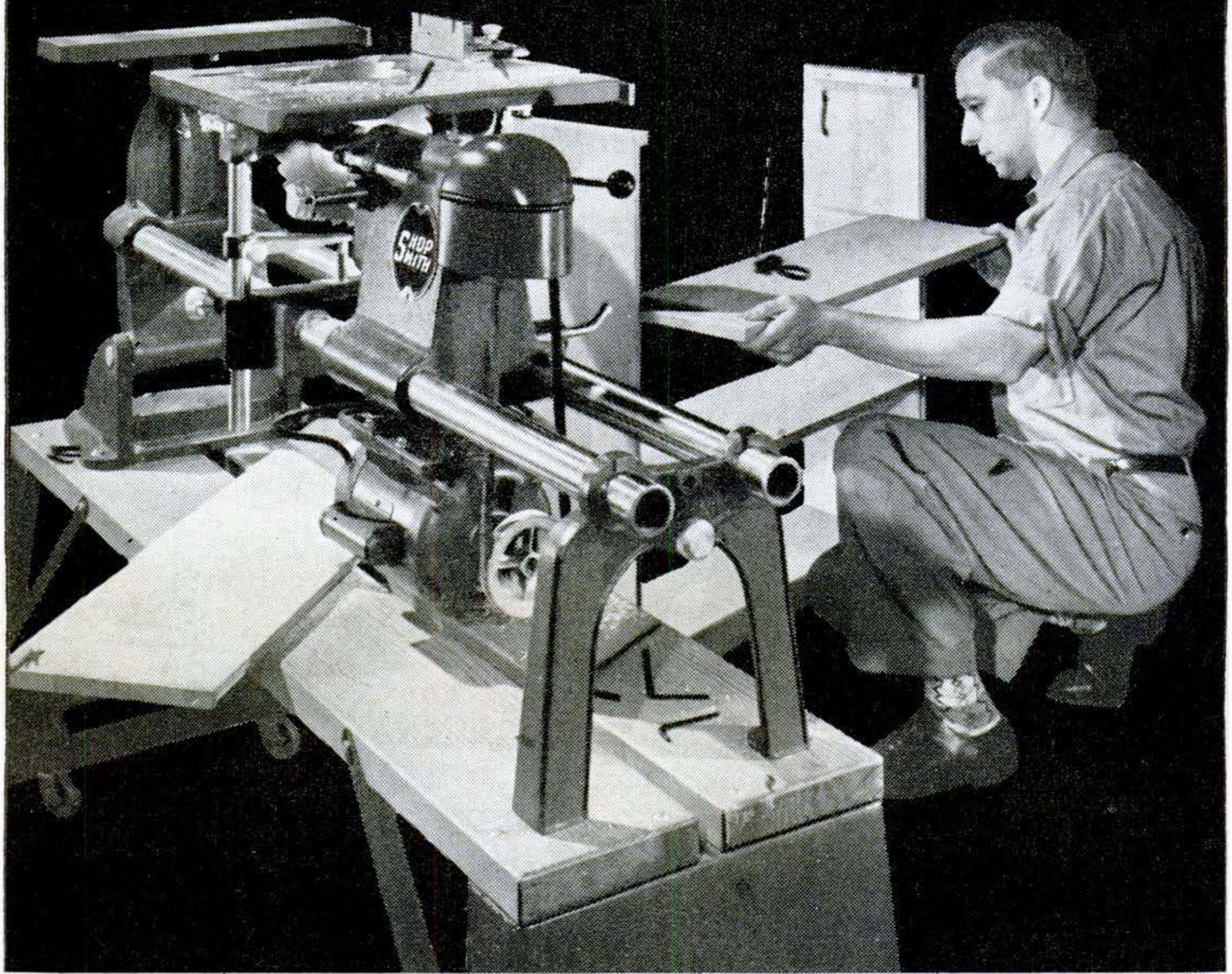
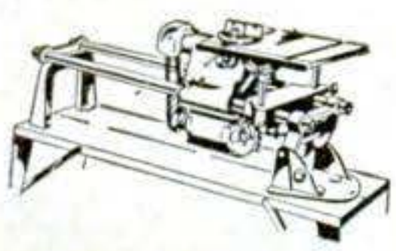
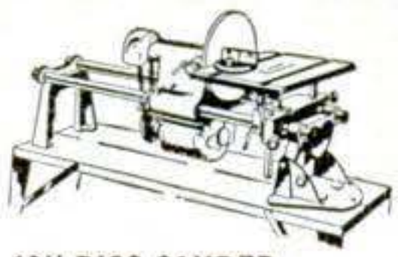
How can you go wrong?

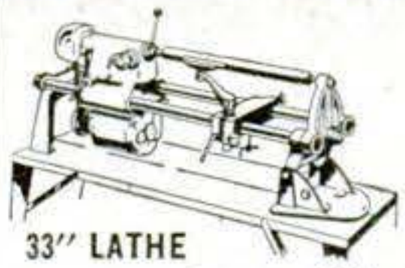




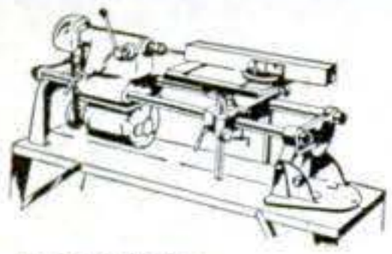
8" CIRCULAR SAW
has 48" blade-to-fence capacity! With capacity like this you can easily saw big doors, screens, storm sash.



12" DISC SANDER
handles room-length boards. Disc feeds into work for greater accuracy, speed, safety, and precision finishing of duplicate parts.

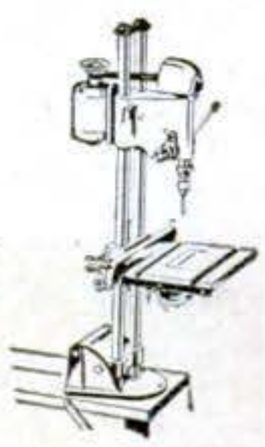


33" LATHE
turns work up to 15" dia.—4" more than most lathes. Sliding headstock puts work within easy reach; swiveling tool rest slides parallel to work.



HORIZONTAL DRILL PRESS
is especially handy for doweling and drilling large, bulky work. No jigs required—just lay work flat on table.

VERTICAL DRILL PRESS
is both table model (table to chuck, 27") and floor model (floor to chuck, 55"). Jacobs key chuck takes drills from 5/64" to ½" dia.



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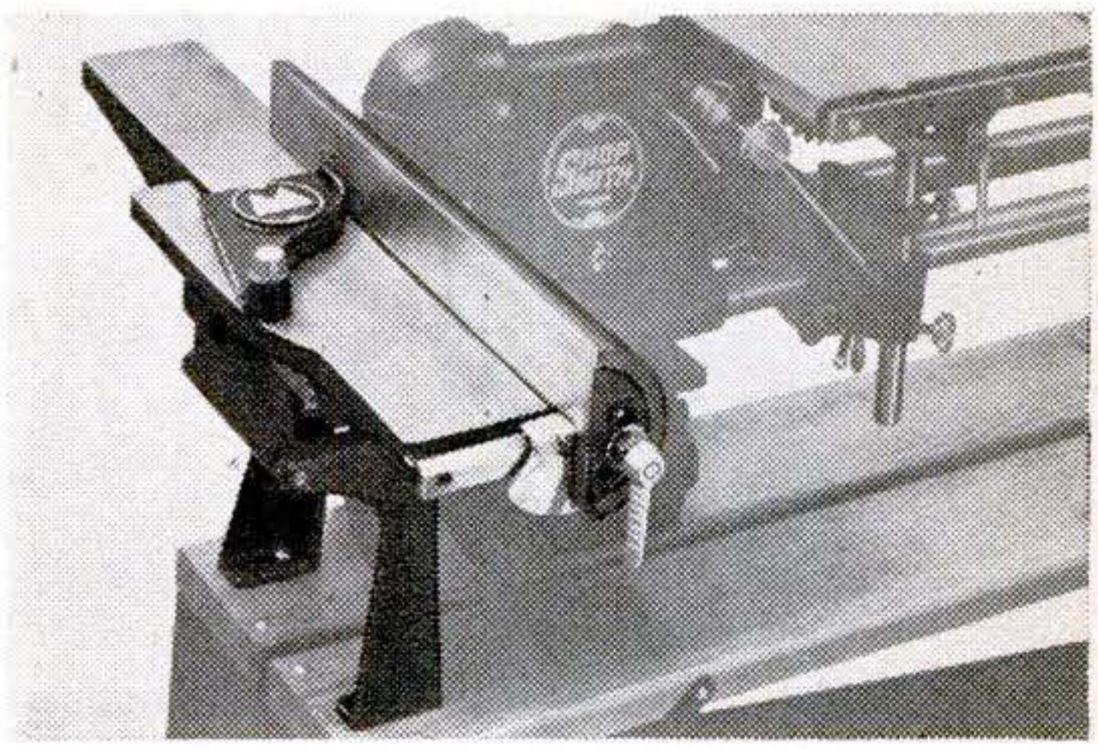
You just can't—with SHOPSMITH. It has the accuracy, the capacity, the speed and power you need. And it's versatile—5 big tools in one compact unit. SHOPSMITH is the best investment you can make in a power tool.

A PRECISION TOOL! Blade-to-fence settings on the SHOPSMITH Circular Saw are so accurate, you can shave strips of wood as thin as the pages of this magazine—and you can do it quickly, time after time. The Disc Sander feeds *into* the work, and can be stopped on a hairline. The Vertical and Horizontal Drill Presses have built-in jigs, unique micro-settings. Centerless-ground ways are stress-tested at over a ton to assure rigidity and accuracy in Lathe and other operations.

A HIGH-CAPACITY TOOL! The Circular Saw cuts 8′ panels in half, into two 4′ sections . . . the Disc Sander and Horizontal Drill Press can handle *room-length* boards . . . the Lathe turns work 33″ long, 15″ in diameter . . . and the Vertical Drill Press can drill to the center of a 15″ circle.

A HIGH-SPEED, POWERFUL TOOL! You can turn out duplicate parts by the dozen on SHOPSMITH, in just a few moments. And there's power to spare for most uses in the heavy-duty ½ hp. motor, but if you do need more, you can get it with the special SHOPSMITH ¾ hp. motor.

• ***Don't take our word for it!*** Ask for a *demonstration* of SHOPSMITH and other power tools. See how they compare on capacity, accuracy, speed, power, versatility and ability to change from one tool to another *quickly*. At leading hardware and department stores or any Montgomery Ward store.



NEW SHOPSMITH 4″ PRECISION JOINTER! Attaches quickly, easily, doesn't interfere with SHOPSMITH flexibility. Can be operated as conventional saw-jointer combination. Unique Allen-wrench adjustment of 3-knife cutter head is easiest ever devised. Grease-sealed ball bearings. In-feed, outfeed tables full 28″ long. Fence tilts 45° to 45°. Width of cut, 4″; depth of rabbet, 5/16″. Only $44.95 (mounting kit, $9.95).

COMPLETE 5-TOOL UNIT

ONLY **$199.50**

Motor* and bench extra

NEW! CHROME RUST PROOFING standard on all SHOPSMITHS. Now—easier maintenance, extra protection in damp locations. *Special SHOPSMITH heavy-duty ball-bearing motors: ½ hp., $34.50; ¾ hp., $44.50.

SHOP SMITH

New McGraw-Hill power tool & woodworking book—just out!

283 pages of valuable information and woodworking tips, 560 drawings and photographs. The most complete power woodworking book ever published! Written by R. J. DeChristoforo, experienced woodworker and author. Only $4.95 postpaid. Ask for *Power Tool Woodworking for Everyone* at any book store or SHOPSMITH dealer.

MAGNA ENGINEERING CORP.

Dept. 246-A at factory nearest you:
12819 Coit Rd., Cleveland 8, Ohio,
or Menlo Park, California

Please send my free copy of the 16-page SHOPSMITH booklet.

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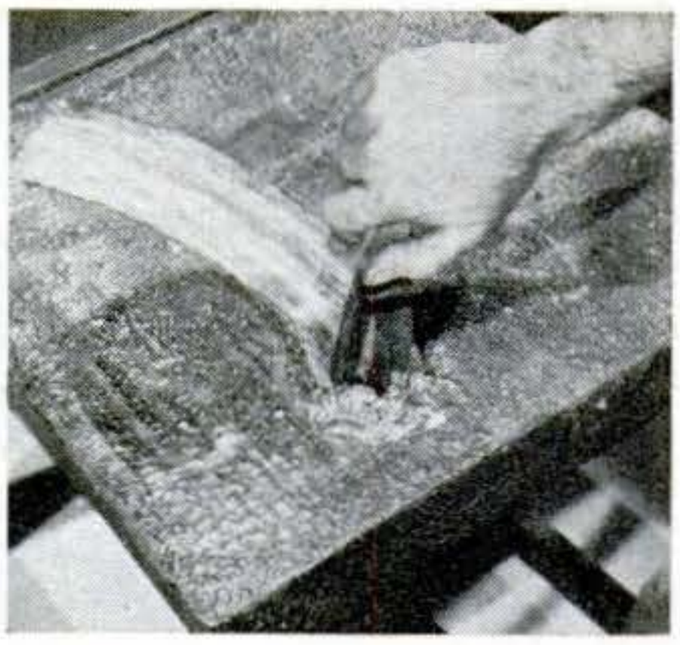
How to Get Smoother, Slicker Paint Jobs



Step 1. *Prepare surface.* Remove all chipped and peeling paint or varnish down to bare wood. You can do this easily and quickly with Strypeeze . . . the *guaranteed* paint remover that stays wet longer, clings to upright surfaces, doesn't harm hands.

Step 2. *Rebuild broken corners, fill nicks and holes.* A powder-form plastic putty, Savogran Wood Putty, is ideal for this. You can form it, tool it . . . and it doesn't shrink. For cracks in plaster, use Savogran Crack Filler. It's the original patented quick-hardening water putty.

Step 3. *Start job with clean brushes.* If it's an old brush, clean it before you begin painting. Clean all brushes after painting and whenever you change colors. Kwikeeze, the Liquid Brush Cleaner, softens *hard* brushes in minutes . . . cleans out fresh paint instantly! May be reused.

Whenever you're painting, you need

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PRODUCTS . . . at better paint & hardware stores

Write for free helpful literature

SAVOGRAN CO., Dept. 37. 25 Huntington Ave., Boston 16, Mass.

Gus Saves the Old Homestead

[*Continued from page 198*]

Billy Ryan ran for his patrol car, pulled up beside Gus and waved him in.

"We'll follow him up the grade," he said, "and stand by till that load breaks free."

For a quarter of a mile they trailed at a safe distance. Then the road was leveling. Just ahead was a broad, clear space where Berry could pull off to the side. Even if the poles let go, now, they wouldn't tumble down the mountain. Another 100 feet—50—20—10.

The truck ground to a stop.

Cables Lash Out in Arcs of Fury

Berry climbed out of the cab, grinning.

That grin stayed with him even when the cables gave a sudden hitch, twanged, and lashed out in twin arcs of fury. With a deafening roar, the poles rumbled to the ground.

Billy Ryan whistled.

"That," he said, "was luck."

Berry shook his head.

"Aren't you forgetting Mr. Wilson? Say, what was causing all the trouble, anyhow?"

Gus handed him the ceramic filter.

"You're kidding!"

"No. That little gadget was blocking the flow of gas. When you gunned the engine and it didn't quit, it suddenly came to me. That filter is so old that all of the impurities it had trapped finally plugged up most of its microscopic holes. What little fuel did get through to the carburetor was only enough to let the engine idle."

Berry was still incredulous.

"I've never heard the like. Say, would you fellows do me one more favor? I'd like to get a call through to the company, so they'll send some equipment up to put those poles back on the truck."

"Will do," Billy promised. "Are you ready to go, Gus?"

As the patrol car spiraled smoothly down East Mountain, Ryan cocked an eye at his nodding companion.

"Sure was a pretty sunrise!" END

Meter Miser

In the Alps, McAndrew hired a taxi at the station to get to his hotel. On the way the taxi skidded downhill and the driver yelled, "My brakes are gone. I can't stop the car!"

McAndrew, very excited, replied, "At any rate, mon, stop the meter!"—*The Right Hand.*

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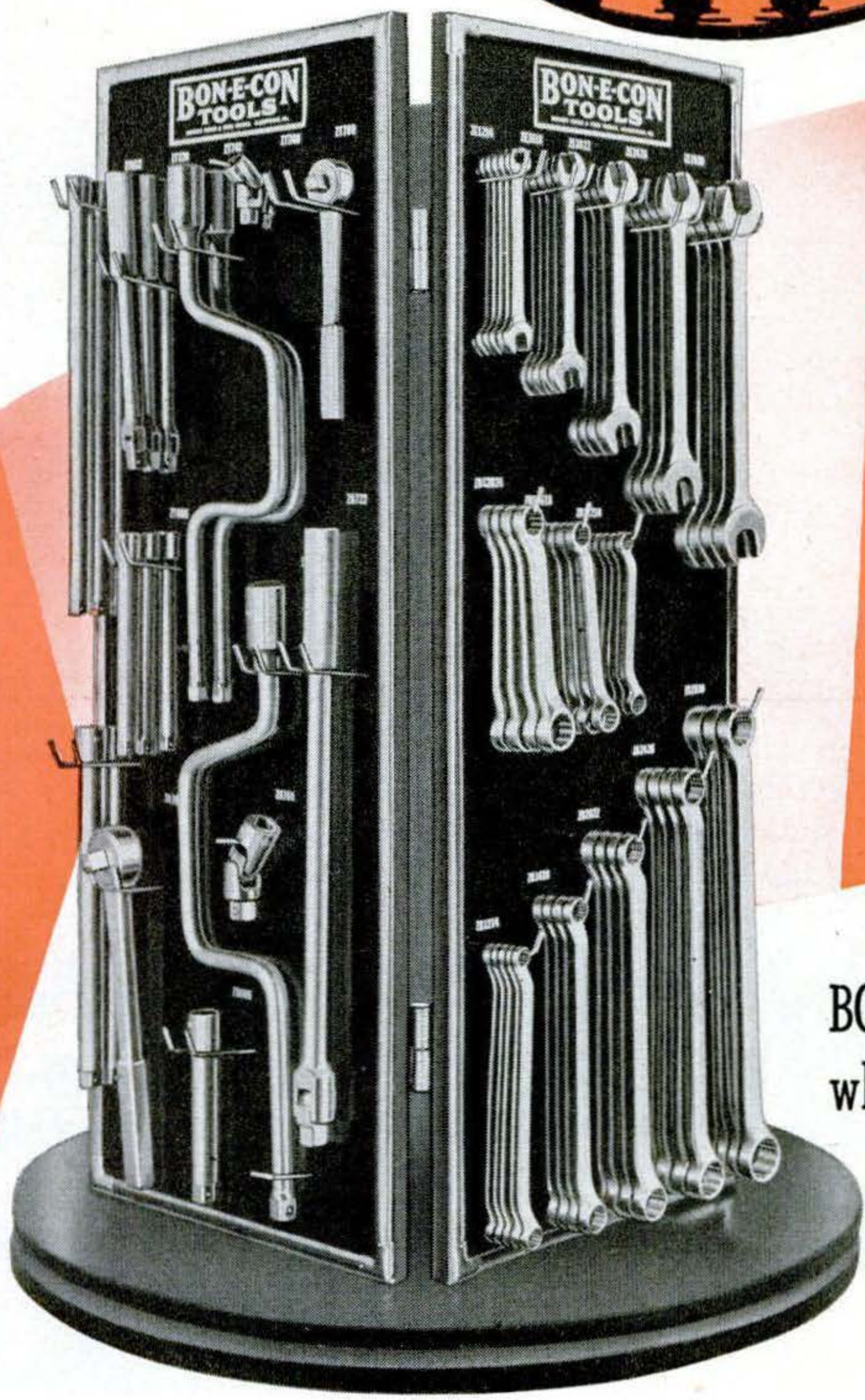
BON-E-CON TOOLS



TOOLS any mechanic would value ...at prices anyone can afford!

Look for this BON-E-CON display wherever fine tools are sold.

BONNEY FORGE & TOOL WORKS • ALLENTOWN • PENNSYLVANIA

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[Continued from page 152]

nually to deep-water Atlantic seaports.

The first of these "wrong-way Corrigans" follows the old Portuguese slave route across the southern Congo and Angola to Benguela, 500 miles down the coast from Matadi. This Bas Congo-Katanga, Benguela could be called the Duluth, Mesabi & Iron Range Railway of Africa.

It is a "git-thar-fustest-with-the-most-est," heavy-duty pike that carries everything from industrial diamonds to titanium, behind what are among the strangest and most powerful locomotives ever seen outside the United States. Set the running gears of two American steam locomotives far enough apart to form a pair of enormous car trucks. Then pivot a boiler and firebox between them, and place a water tank out front and a coal hopper over the rear truck. That gives you a rough idea of the "Garratt"-type locomotive—a design which has only one drawback. When the engine uses up the greater part of its fuel and water, the wheels begin to slip.

The Leopoldville-Katanga-Dilolo Railway, second fork of the Belgian extension, made a feeble attempt to plod on toward Cairo. But the temptation to turn a fast franc was too great. So this line also heads for the Atlantic, winding up at Port Francqui, 525 miles from Leopoldville by the Kasai and Congo Rivers.

At this point the bits and pieces begin to add up. Lay trackage between Port Francqui and Leopoldville, as the Belgians intend to do, and you trim two weeks from the time now spent transferring freight from trains to steamboats and back to trains. You also have a through line which lops 300 miles from the present rail-sea route between Katanga and North Atlantic ports. And you have a fine alternate route to the south —the Bas Congo-Katanga, Benguela.

This Leopoldville-Katanga-Dilolo ex-

[Continued on page 254]

A COMPLETE WORKSHOP in itself! Easy to convert . . . It's light, flexible and simple to operate, yet precision-built to finest professional quality. The most versatile and useful all-purpose woodworking power tool ever developed!

THE SENSATIONAL NEW
SHOPMASTER
Universal

COMPLETE WITH STAND
Mounts work table, provides ample storage for attachments. Tilts back on casters for easy moving.

$269.95 LESS MOTOR
(slightly higher in zone 2).

ALL MOVING PARTS GLIDE ON BALL BEARINGS
Easy-to-read calibrations permit quick, precise setting. Locks in any position.

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CYLINDER WEAR CUT 49% with Miracle Power

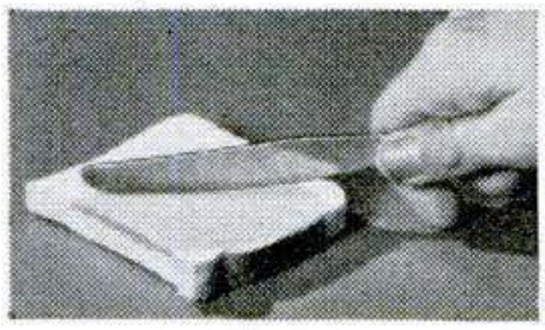
You can't argue with *facts.* Wetmore Hodges & Associates, independent laboratory, road tested two engines—one with Miracle Power, one without.

One of many benefits of Miracle Power proved by this test is its capacity to lubricate upper cylinders. Oil alone won't lubricate here because temperatures may reach up to 1400° and oil burns at 550°. But Miracle Power, a blend of petroleum super lubricants including colloidal synthetic graphite in suspension, withstands far greater heat. That's why the Miracle Power test engine had only half as much bore wear as the engine without Miracle Power.

Other results: After 33,703 miles, the Miracle Power engine was using 33% less oil, had 13% more compression, 56% more plug life, 15% less ring wear.

Use Miracle Power in *your* gas and oil—accept no substitutes.

Stops DRY STARTING Damage . . . Treats the Engine, Not the Oil!



METAL ABSORBS MIRACLE POWER AS BREAD ABSORBS BUTTER—Miracle Power fills microscopic valleys in metal with a breathlike graphoid film. This film holds oil preventing Dry Starting damage (metal to metal contact during the up to five minutes it takes to pump oil to vital parts after starting). It also lubricates when the oil film breaks or burns off.

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Lubricates *Right* . . . from the Start

Get Miracle Power (money back guarantee) at gas stations, garages and Ford, Kaiser-Frazer, Willys and other car dealers — 75c ($1.00 in Canada)

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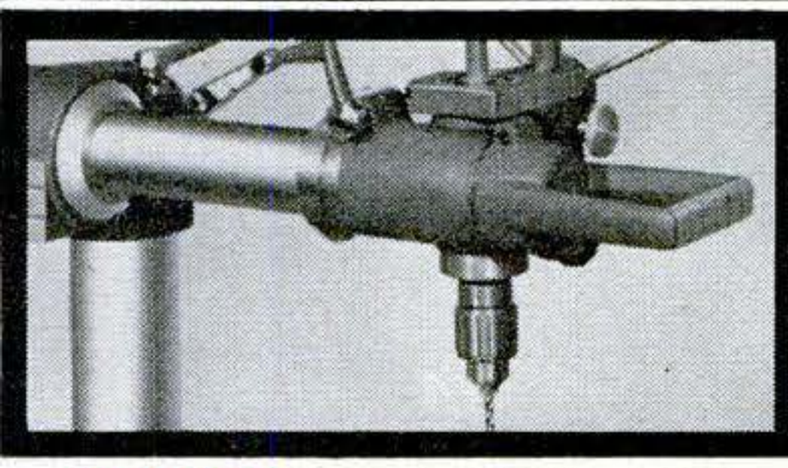
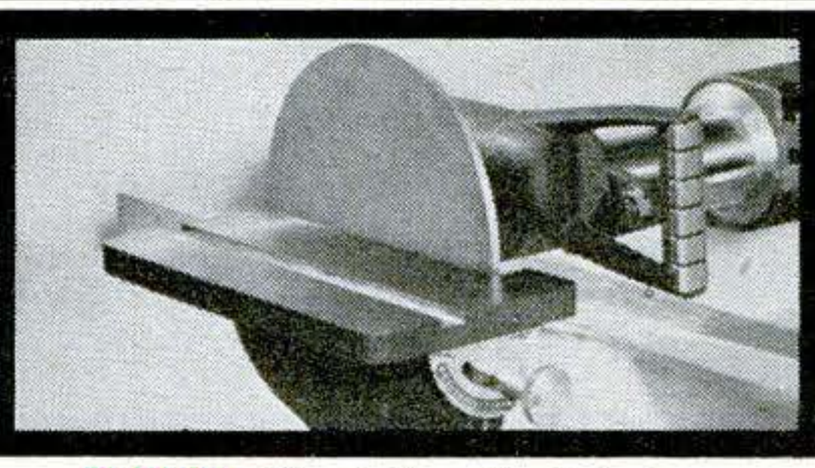
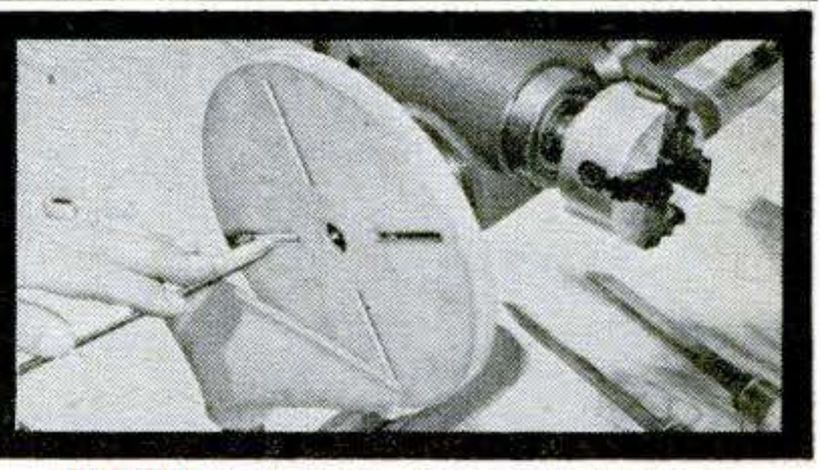


DRILL PRESS. 3" stroke, 18" throat. Drill, rout or mortise at any angle, in 36" circle.



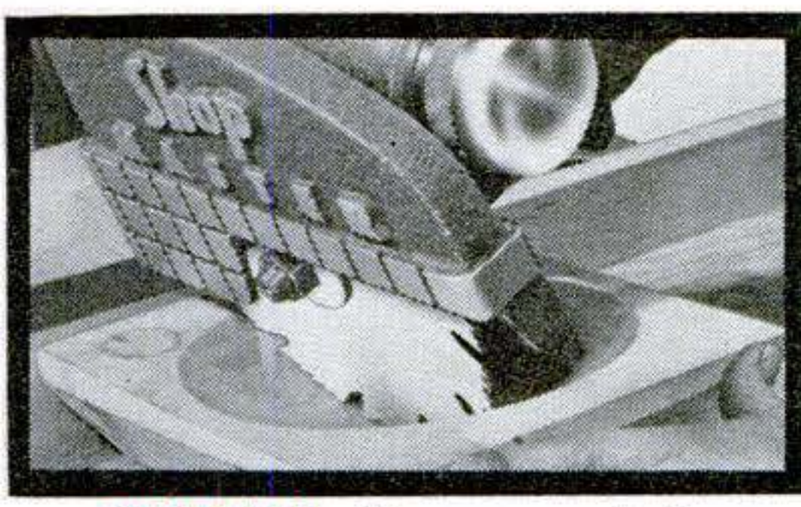
SANDER. Either belt or disc locks in vertical or horizontal position, or at any angle.



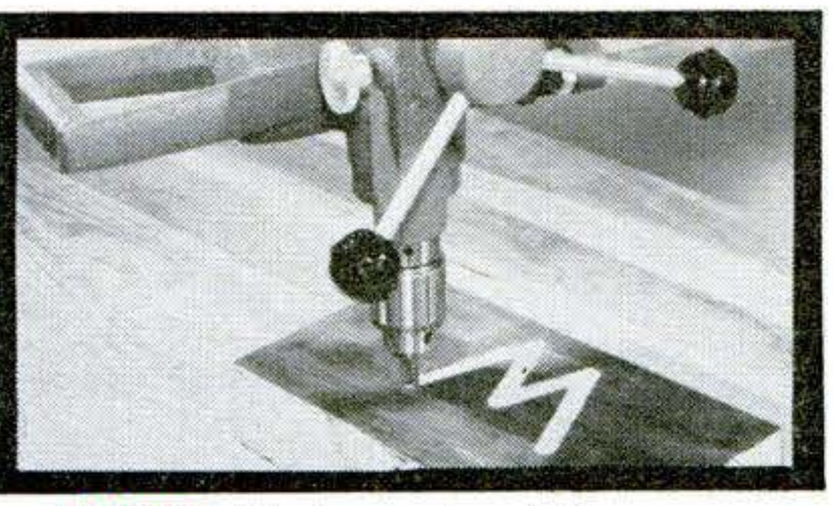
LATHE. 10" swing, handles work up to 31" long. Uses standard lathe accessories.

Power Tool

IT'S A CIRCLE SAW, DRILL PRESS, LATHE, SANDER, ROUTER, SHAPER, *ALL IN ONE!*



CIRCLE SAW. Mitres, compound mitres, cross-cuts, dados, rips, cups, grooves. 8" blade, 2 9/16" cut.



ROUTER. Work remains stationary, head moves in any direction to rout letters or any desired pattern.

WRITE FOR CATALOG

Please send information on new Shopmaster Universal Power Tool and complete line of quality power tools and accessories.

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Address.....

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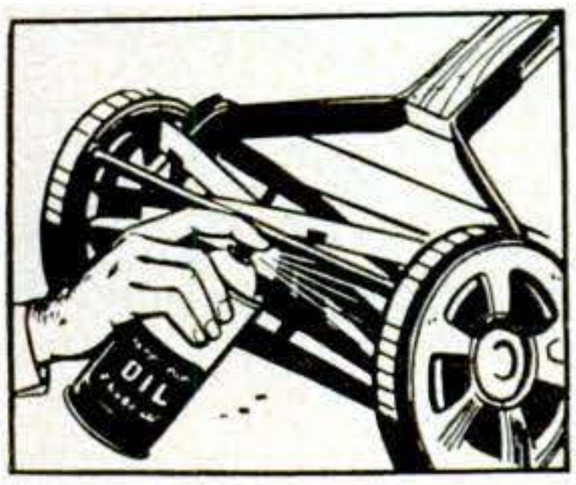
Spray Tools To Keep 'Em CLEAN!



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No messy rags... oily fingers!

IDEAL for mowers, shears, clippers, other garden tools!

Contains Special Rust Inhibitor!

ACTUAL TESTS by immersion show that 3-IN-ONE Oil prevents rust where other oils fail!

JUST PUSH VALVE—OUT COMES FINE MIST OF OIL!

3-IN-ONE Oil also available in the familiar Spout Cans in 10c, 25c, and 50c Sizes

New 3-IN-ONE *spra-gun*

African Railroad to Tap Treasures

[Continued from page 252]

tension has already been surveyed, and construction should begin in 1954.

The Upper Congo-Great African Lakes Railway, the Congo's final contribution to the trans-African project, is a little meter-gauge pike on which you can charter a private car built by native carpenters of African hardwoods, varnished and hand-rubbed, inside and out, and equipped with brass bedsteads and a bathtub. The line's 50 wood-burning locomotives, 475 freight wagons and 35 passenger cars are hardly long enough to carry the impressive title "Compagnie des Chemins de Fer du Congo Supérieur aux Grands Lacs Africains." But their pygmy size is no clue to the bull-elephant job turned in by this Upper Congo-Great African Lakes. It is a baby Pere Marquette—a combination railroad and steamship line which wrestles the hides, grain, cotton, copal and lumber of the upper Congo down to Albertville, then ferries them 80 miles across an equatorial puddle that is longer than Lake Michigan and deeper than Superior. This is Lake Tanganyika, where Henry Stanley tipped his pith helmet to Dr. David Livingstone in 1871.

Both gentlemen would be surprised today, to find a bustling east-shore port within a javelin's throw of the point where they met. Here, at Kigoma, the Grands Lacs dumps a half million tons of traffic annually into the laps of the British.

Today, the Upper Congo-Great African Lakes is being widened to the 3 ft. 6 in. gauge of the railroads to the west, and the termite-proof steel ties of an extension are already being pushed across 200 miles of comparatively open country to a link with the Leopoldville-Katanga-Dilolo Railway at Kamina.

The Tanganyika Railway, built by the Germans but now in British hands, would fit in neatly. When German East Africa fell into British hands after World War I, the undeclared dividend was this 773-mile-long, meter-gauge line, which

[Continued on page 256]

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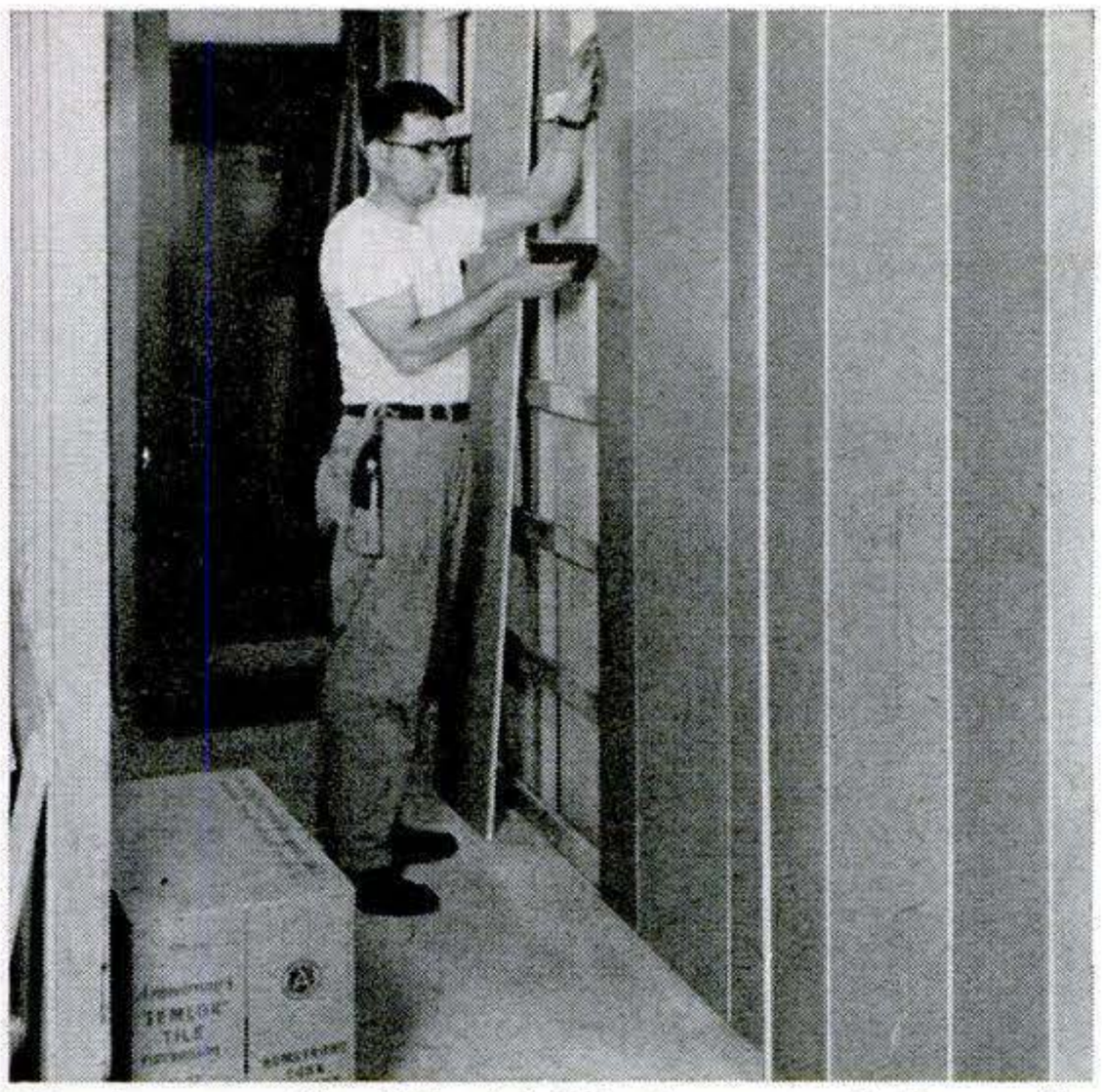


Handsome walls of Temlok Plank go up quickly, easily

"Lok-Bevel" joint on Temlok Tile speeds application

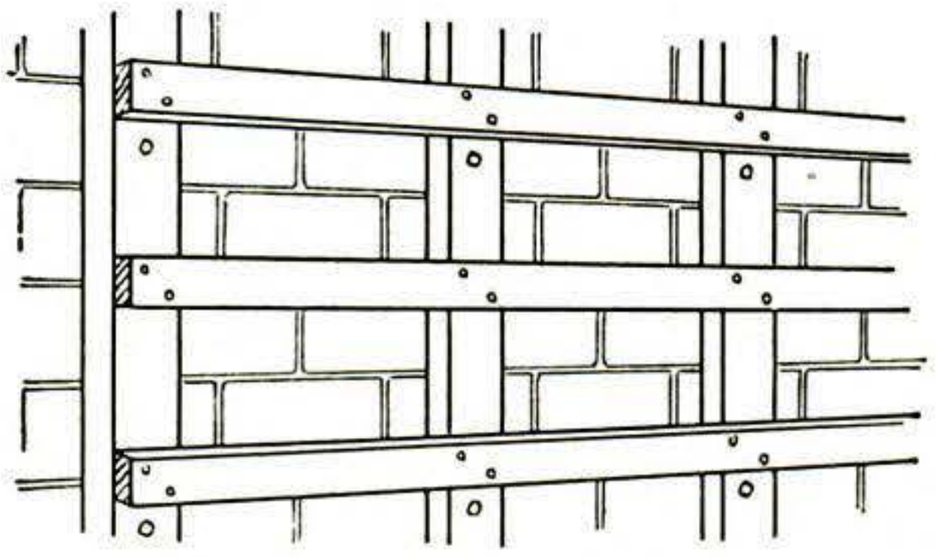
IT'S EASY TO FINISH YOUR BASEMENT WITH TEMLOK

Here's a practical way to convert your basement into an attractive room for work or play. You can do the job yourself quickly, economically, with Armstrong's Temlok Plank and Tile. Both materials are made with the "Lok-Bevel" joint which makes nailing or stapling extra easy. This special tongue-and-groove conceals the nails or staples, insures a neat, professional looking joint. You'll be proud of the results.

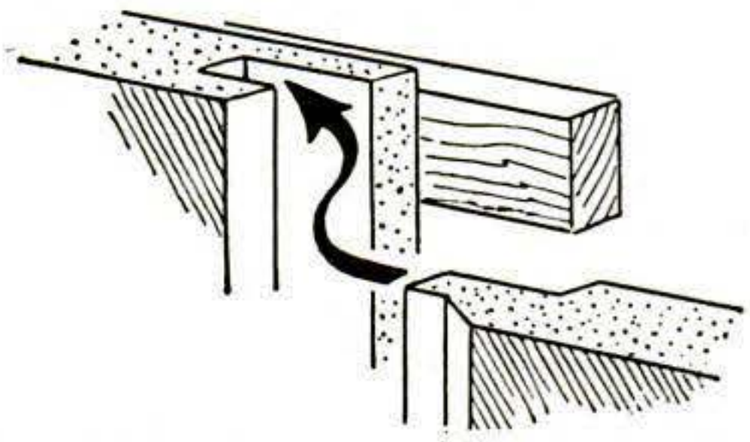
What's more, you don't have to paint Temlok. It comes already finished with two coats of good-looking, durable paint. Temlok is a wood fiber insulation board. It will help keep your basement comfortable.

Temlok Plank for walls is made in a handsome "Suntan Blend", in 8", 12", and 16" widths, and up to 12' lengths. Ceiling tiles come in White or Light Ivory, either plain or perforated. Sizes are 12"x12", 16"x16", and 16"x32".

Ask your local lumber or building supply dealer to show you samples of Temlok and help you with your plans. For free booklet, "New Ways to Remodel Your Home," write Armstrong Cork Company, 3709 Washington Avenue, Lancaster, Pa.



Anchor wide flat side of 2"x4" studs against the foundation, two feet apart. Nail 1"x3" furring strips 12" apart over studs and finish with Temlok Plank. Cross-furring behind Temlok provides air circulation. Small vents at top and bottom carry off basement moisture.



This special joint on Armstrong's Temlok Tile and Plank provides a wide nailing flange and speeds installation. Nailheads and staples are concealed by the adjoining piece of material.

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African Railroad to Tap Treasures

[Continued from page 254]

had been pushed across the colony from Dar es Salaam on the Indian Ocean to Kigoma. It would be an easy matter to widen the rails, and to link the ports on the west and east shores of Lake Tanganyika with modern car ferries.

The Tanganyika Railway comes down to the sea some 200 miles south of Mombasa and Mackinnon Road. Dar es Salaam and Mombasa could be linked with a coastal railway.

The Kenya-Uganda Railway stands ready to offer an alternate solution to the problem. This 50-year-old, British-built line runs northeastward out of Mombasa through Mackinnon Road, and on to Lake Victoria. Along its right-of-way, you can still see the ruins of iron-sheathed huts that once protected track gangs from the arrows of the Nandis.

Take an 80-mile branch of this Kenya-Uganda Railway, which heads directly west from Mackinnon Road, and extend it 600 miles around the head of Lake Tanganyika to the Upper Congo-Great African Lakes Railway. That would give you a trans-African line which not only shortens the rail distance to Mombasa, but eliminates the 90-mile boat trip across Lake Tanganyika.

Whether the British build this Kenya-Uganda railway extension, or settle for a broadened Tanganyika Railway, experts agree that Africa will have her first trans-continental line by 1958.

Abraham Lincoln once said that it was the misfortune of the United States that politically her railroads should have been laid from north to south, whereas economics forced them to run east and west.

Africa is faced with no such problem. Politically and economically, the trans-African railway must link the west and the east. END

Reckless Romping

DIDYA hear about the ram who fell off the cliff? He didn't see the ewe turn.—*The Lufkin Line.*

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7 saws in 1
RIP, CROSSCUT, KEY-HOLE, COPING, SCROLL, BAND OR JIG

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All-metal Whiz-Saw table may be secured with screws to wood bench or held in vise.

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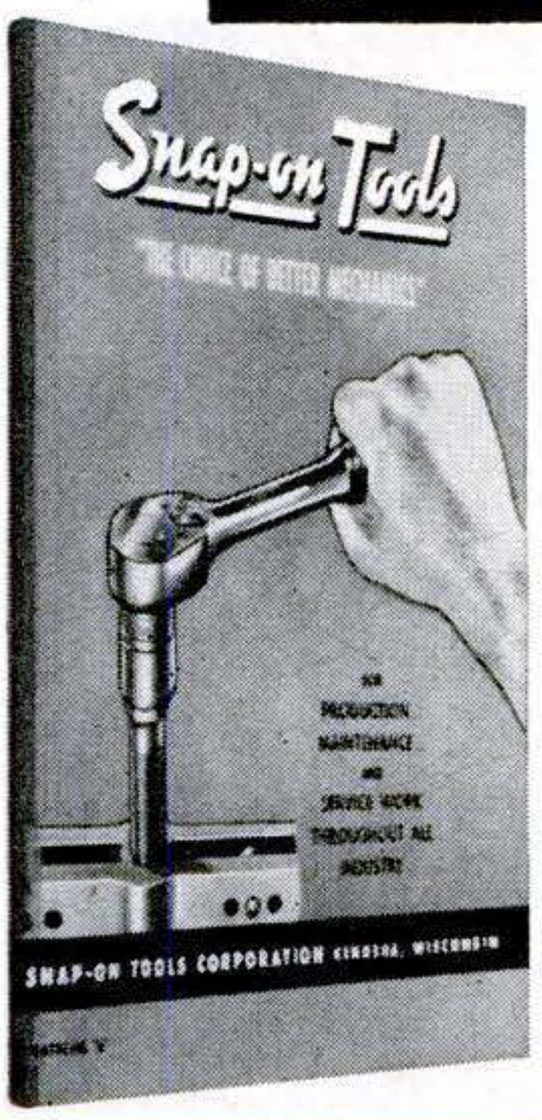

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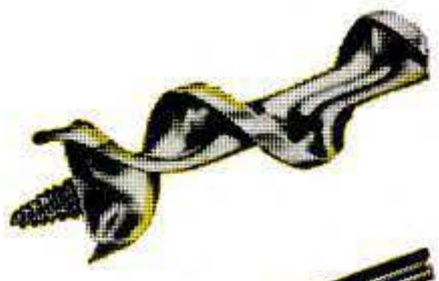
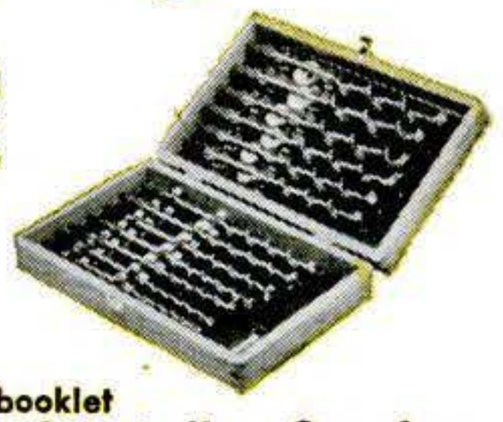
IRWIN 62T Solid Center Auger Bit — sizes ¼" to 1½". Double cutter head. Open throat for quick chip clearance. No binding, no chewed edges.



IRWIN All-Purpose Expansive Bits — two types, small and large sizes. Boring range ⅝" to 3". Accurate, easily adjusted. Two cutters with each bit. Individually packaged.

IRWIN Bit Sets — in hardwood box or plastic rolls. 6, 10 or 13 bit assortments. Sizes ¼" to 1". Ideal gift for handyman or professional.



FREE! Useful booklet tells, How to Select, Use, Care for Auger Bits. Send name and address to IRWIN, Dept. 14, Wilmington, Ohio.

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screw drivers
screw driver bits

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Please send me Hunt's BIG, NEW time and money saving Catalog No. 20 for Woodworkers. Enclosed is 15c.

Name_____

Address_____

City_____ Zone_____ State_____

"Barnes Dance" Cuts Traffic Toll

[Continued from page 102]

and operated the light by hand for 45 minutes in sub-zero weather. The repairman happened to be away up in north Denver.

"I felt like the boy with his finger in the dike," he says. "Only, it was my ear that was suffering."

Barnes is an eminently reasonable man and he has a dependable sense of humor. He would surely have grinned if he had heard the disparaging remark the airport bus driver made about one of his mid-block signal lights.

Barnes Explains Signal

"There's a very good reason for that," he unquestionably would have said, "and here it is."

He would then have explained that along a through street, stop signs are adequate to control traffic at intersections only as long as there aren't many cars traveling on the main thoroughfare. Once the through traffic steps up to peak volume, there is a tendency for the drivers in it to forget about the fellows behind the stop signs. Unless a gap is created every so often, the cars on the intersecting streets have a rough time crossing or entering the main artery.

These gaps can be opened up by placing four signal lights at the intersections. But Barnes figured that he could accomplish the same result by hanging a single light occasionally in mid-block. A single overhead signal light costs about $300. Four two-way signal lights on posts cost around $1,500. By choosing the simpler, if unorthodox, way of handling the situation, Barnes was able to buy five times as much traffic control for his money.

Even the airport bus driver would have approved of that. END

Right of Way

Policeman (after collision): "You saw this lady driving toward you. Why didn't you give her half the road?"
Motorist: "I couldn't tell which half she wanted."—*Burns and Mixes.*

SHOP BY MAIL and SAVE at GROBAN'S

NEW AIR FORCE SURPLUS
SHATTERPROOF AIR TANK

Item #303

ITEM #303—Use for air compressors, surge tanks, CO-2 tanks, liquid containers, floats, buoys, 24" long —4" diameter—½" pipe thread port. Ship. Wt. 10 lbs. F.O.B. Chicago..... **2.50**

ITEM #16C—Double acting hydraulic cylinder, 1½" bore, 26" stroke. Will lift 1760 lbs. with 1000 P.S.I. line pressure. Weight 8 lbs. A $55.00 value. Now only..... **16.95** Postpaid

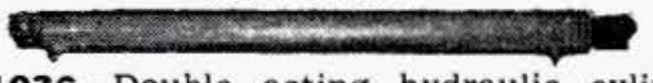
ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 P.S.I. line pressure is 12,500 lbs. Ship. wt. 30 lbs. F.O.B. Chicago. An excellent buy for **32.50**

HEAVY DUTY HYDRAULIC and AIR EQUIPMENT

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc.

ALL ITEMS BRAND NEW—UNCONDITIONALLY GUARANTEED

Item #1036



ITEM #1036—Double acting hydraulic cylinder, 3" bore, 36" stroke, ½" pipe thread ports, 1¼" solid steel shaft. Overall length closed 49", clevis mounting at base and shaft. FEATURES • Cup & Chevron Packing • All Welded Construction • Precision Ground and Honed Construction • Will lift 7000 lbs. using 1000 P.S.I. line pressure. Weight (net) 57½ lbs. F.O.B. Chicago..... **50.00**

ITEM #150—Double acting hydraulic cylinder, 2⅜" bore, 12" stroke. Use either foot or clevis mounting. Will lift 4400 lbs. using 1000 P.S.I. Overall length 19½". Shipping weight 8 lbs. Postpaid..... **18.00**

Item #126—Four-way, open center control valve with built in adjustable relief valve. Factory set at 1000 P.S.I., spring loaded neutral position, for use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Fully balanced plunger type, smooth, positive, easy operation. Can be used as single unit or mounted in series of any combinations desired. Has ¾" pipe thread inlet and outlet, ½" pipe thread cylinder ports. Newly manufactured to our specifications. Shipping weight 8¼ lbs. An outstanding buy! F. O. B. Chicago. **21.50**

ITEM #126

EXTRA HEAVY DUTY DOUBLE ACTION HYDRAULIC CYLINDER

ITEM #224—3¼" bore, 24" stroke, will lift 8250 lbs. with 1000 P.S.I. line pressure, ½" pipe thread ports—1⅜" stress-proof ground, polished and plated—solid steel shaft. Overall length closed 36". ¼" steel wall cylinder barrel, clevis mounting at base and shaft. Features—Tie Rod construction. Honed barrel. Ship. wt. 50 lbs. F.O.B. Chicago.. **39.60**

Quick Disconnect Hydraulic Hose Coupler

ITEM #309—Self sealing, for uncoupling oil lines under pressure. Made by The Brunning Company. Each end threaded for ½" pipe connection. Rugged three piece precision steel construction. 4" long—1½" dia. Ship. Wt. 2 lbs. Regular price **12.50**. Special price, EACH..... **5.75** Postpaid

Ross 4-Way Foot Operated AIR VALVE

ITEM #60

BRAND NEW—**Item #60**—For double-acting pneumatic devices. Fine for operating presses, air vises, air machinery of many types. Heavy duty cast construction. No neutral position. Maintains pressure against the piston when the foot control is in the "Up" position. Threaded for ½" pipe. Dimensions of valve body: 7¾" long x 4¼" width x 7½" high. Net weight 28 lbs. A $64.00 value for only **19.50** F.O.B. CHICAGO

Brand New—Berry—Heavy Duty Hydraulic Pump or Motor

ITEM #166—use on farm equipment, road machinery, vibrators, paper mills, wire reels, hydraulic brakes. Ball bearing construction, balanced cam design assures high efficiency performance. When used as a pump: delivers 11 G.P.M., 1000 P.S.I., 8 H.P. at 1800 R.P.M. as a HYDRAULIC MOTOR: Rated up to 12 H.P., up to 2400 R.P.M. Standard ¾" pipe thread ports, ¾" shaft with keyway. Dimensions: 14½" x 8" x 7". Weight 63 lbs. Regular price today $212.00. Our money saving price F.O.B. Chicago. **59.50** 2 for **110.00**

ITEM #166

GENERATORS Many Sizes From 350 Watts to 25 KVA

ITEM #183

Item #183 — 3000 to 4000 WATT GENERATOR SET —FEATURES— Power for your home or business. Simply connect to power panel or house circuit. • Constant voltage regardless of load. • Push button start or stop. • Easily made full automatic start or stop. **SPECIFICATIONS**—Sizes 19"x30"x48". Steel skids, weatherproof housing, requires no building. Wt. 725 lbs. • Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter. Quiet muffler. 6-volt starter, generator. • Hobart 115 volt, 60 cycle, 3000 to 4000-watt generator. Furnishes either single or three-phase power, 2 or 3 wire. • Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's cost over $1200.00. SALE PRICE, F.O.B. Chicago **465.00**

D.C. GENERATORS

ITEM #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't Acq. Cost $300.00. Shpg. wt. 55 lbs. Dimensions: 15"x9"x6". F.O.B. Chicago **22.50**

ITEM #176—Type L-3. Rated 25 amps., 24 volts. Manufactured by Leece-Neville Co. Shpg. wt. 30 lbs. Dimensions 12" x 6½" x 5½". F.O.B. Chicago.... **16.50**

War Surplus Delco-Remy Generator

12 VOLT—25 AMP. ITEM #370

ITEM #370

-built for use on V-8 Cadillac engines. Put it to use on 12 volt electric circuits on automobiles, trucks, marine craft, farm and construction machinery. Built with standard car and swing mount for universal application, and fan type pulley for greater cooling. Generator cuts in at 1550 R.P.M.—P/N-1105908—11" long, 6" dia. Ship. Wt. 35 lbs. Today's list price 58.00. Our sale price, F.O.B. Chicago **19.00**

AC-DC ELECTRIC GENERATOR

Item #317

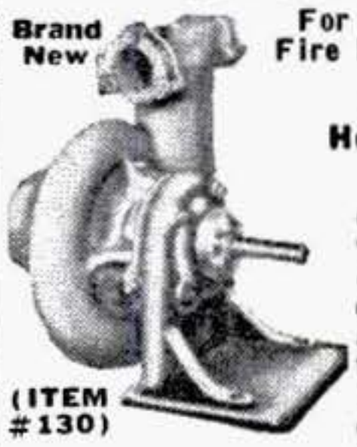
Built to rigid U.S. Navy Air Force specifications. Rated A.C. output: 120 volts, 1200 watts, 10 amps at 800 cycles. D.C. output: 60 amps at 24 volts. Use A.C. power source for house trailers, lights, portable electric tools, and A.C.-D.C. series wound electric motors. When driven by 3 H.P. gasoline engine, makes a dandy auxiliary light plant. The D.C. output is suitable for battery charging, welding, and marine use. Ball bearing construction, ⅞ inch spline shaft. Dimensions: 15"x6"x10". Shipping weight: 50 lbs. Gov't. Acquisition Cost Over $300.00. GROBAN'S Special Value F.O.B. Chicago..... **50.00**

CENTRIFUGAL PUMP

General Motors — Allison

200 GALLONS PER MINUTE

Brand New



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For Draining Basements
Fire Fighting • Irrigation
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Converted for high volume commercial, home, and industrial use. Standard 2½" pipe thread inlet, twin 1¼" pipe thread outlets. Ball bearing supported ¾" shaft. Easy priming. Rotation, counter-clockwise facing shaft. Gov't. acq. cost $145.00. Complete with full instructions. Ship. wt. 35 lbs. F.O.B. Chicago **39.50**

TYPICAL PERFORMANCE DATA

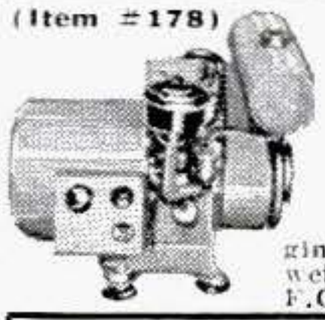
Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	65'	200	5.2	3500
10'	80'	40	1.5	2500
10'	50'	140	5.0	3500
10'	30'	100	3.0	2500

ELECTRIC GENERATOR SET—MODEL 2510

Item #2510

2500 watts, 115 volts, 60 cycles, single phase, A.C. electric generating plant, powered by dependable 6.5 H.P. Wisconsin engine—Two pole ball bearing belt driven high efficiency generator with heavy duty windings for high torque motor starting loads. Rated 3000 watts for intermittent service. Light weight portable rugged unit, easily transported to job site. Consumes 3 quarts of gas per hour at rated load. Dimensions: 24"x20"x24", ship. wt. 220 lbs. Complete with fused outlet box and voltmeter. F.O.B. Chicago **329.00**

(Item #178)



ITEM #178—350 Watt—110 Volt—60 Cycle A.C. Model MS-35-3, made by Midco Mfg. Co. 1 cylinder, 4 cycle engine complete with muffler, starting rope and oil bath air cleaner, direct coupled to a 350 watt generator with voltage control rheostat and twin outlets. Engine speed 1800 R.P.M. Shipping weight 116 lbs. F.O.B. Chicago. **125.00**

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HYDRAULIC SPEED REDUCER

(ITEM #115) WITH FINGERTIP CONTROL

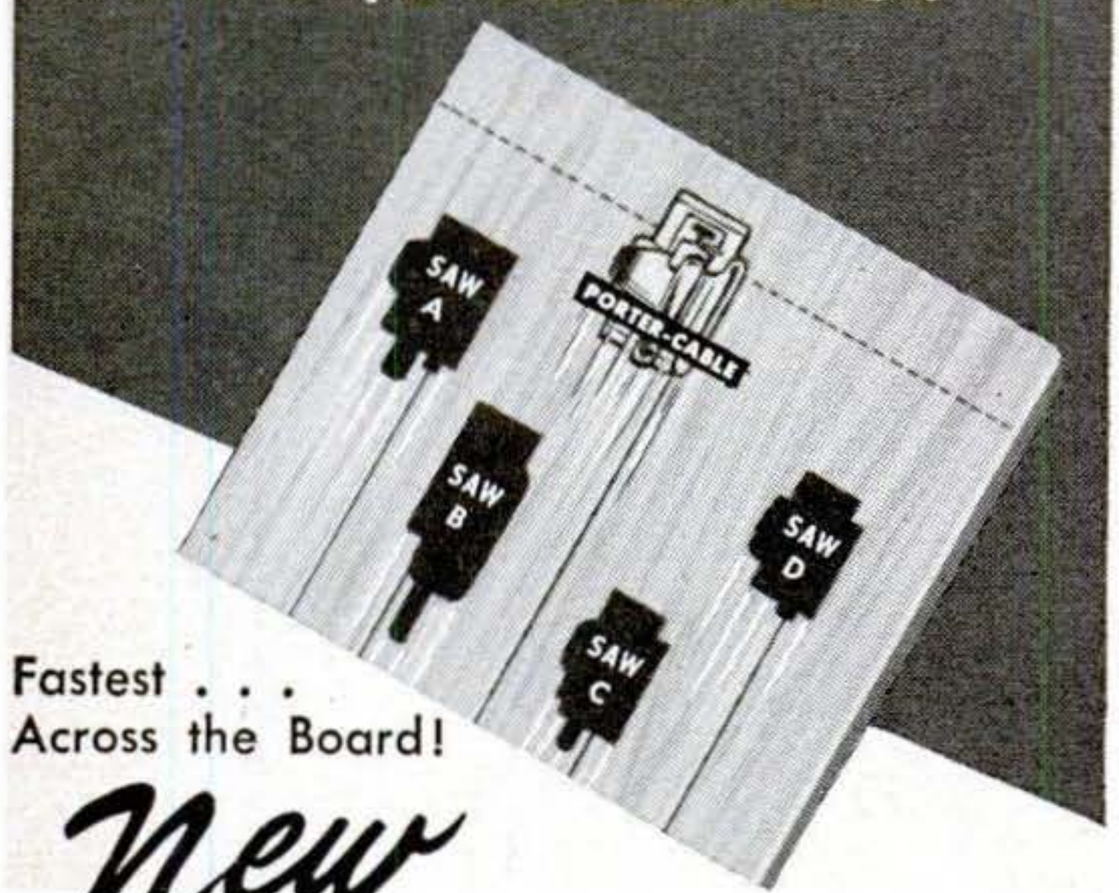
USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of ¼ to 1½ H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure ⅝" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions: 7½"x7½"x11½". Gov't acquisition cost, $428.00. Ship. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago **54.50**

ORDER DIRECT FROM AD — SEND PAYMENT OR PURCHASE ORDER TODAY — SATISFACTION GUARANTEED

GROBAN SUPPLY CO. 1139 SO. WABASH AVE., CHICAGO 5, ILL. DEPT. PS-9

ONLY 7″ SAW to rip 8 feet in 7½ seconds!



Fastest . . .
Across the Board!

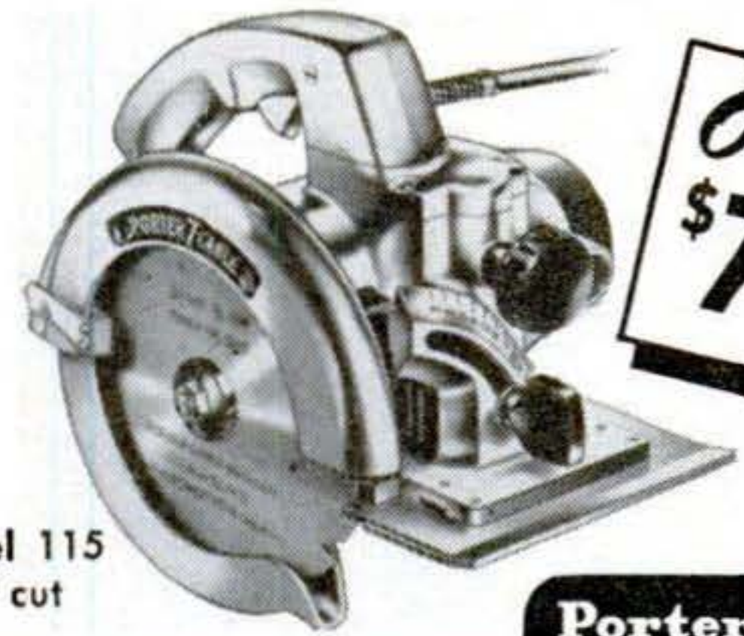
New
Porter-Cable 7″ Saw

In a recent series of on-the-site ripping tests comparing leading 7-inch saws, Porter-Cable's new "Contractor's Special" turned in this amazing speed record:

18.6% faster than Saw A ***51.6% faster than Saw C***
41.7% faster than Saw B ***38.7% faster than Saw D***

Regardless of the depth of cut or type of wood used, the new "Contractor's Special" in every instance finished the cut far faster than any of the other saws tested! For example, on ¾″ Fir Plywood, the "Contractor's Special" averaged 7.5 seconds per 8-foot cut!

"The Contractor's Special"



Only $75.

Model 115
2 5/16″ cut

Porter-Cable
Quality Electric Tools

See this remarkable new 7″ saw at your Porter-Cable Dealer's. Or mail coupon for full details.

PORTER-CABLE Machine Co.,
1469 N. Salina St., Syracuse 8, N. Y.
(In Canada, send to: Strongridge, Ltd., London, Ont.)
Please send complete information on your new Model 115 Saw . . . also name of nearest dealer.

Name.....
Address.....
City..... **County** ..... **State**.....

Manufacturers of SPEEDMATIC and GUILD Electric Tools

Detroit's Newest Basket of Gears

[*Continued from page 119*]

horsepower boost rumored for Chrysler in 1954.

L on the quadrant does give a lot more downhill braking than Drive, of course, and the lever can be popped over at any speed up to 65 m.p.h. (Nothing really hideous will happen if you move it over above that speed; it's just that the reversal forces set up are a bit rough on the works at very high speeds.)

You Can't Count on Engine Drag

There is some foot-off engine braking with the lever in Drive. But as on all torque-converter jobs, there is less than you'd like. You don't go gliding into trouble with the same carefree velocity that free-wheeling used to provide—but you can't count much on engine drag.

Unless you are a speed-shift wizard or drive non-stock equipment, the A323 Chryslers are going to get the jump on you at the light. About the only U. S. stock cars that will consistently stay with them are the Series 62 Caddies. If you tune these two cars with equal proficiency, put them side by side, and floorboard them, they'll stay remarkably close. The Hydra-Matic Caddy will generally lead by a few feet at 25 or 30 m.p.h., the A323 Chrysler by a few feet at 60 m.p.h. What this does to the gas and tire bills shouldn't happen to the U. S. Treasury, but getaway helps sell cars.

How It Compares with Other Automatics

A323 has some relatives on the road, in principles if not in details. Fordomatic and Mercomatic are perhaps the closest. They differ chiefly in offering a quadrant-selected low-to-second (Low) or second-to-high (Drive) range in place of A323's single medium-to-high range. Studebaker's and Packard's automatics are also similar, though they have a lock-up or direct-drive gizmo that Chrysler passed up. Powerglide and Dynaflow also have some similarities to A323. Only Hydra-Matic, an automatic four-speed box without converter, is fundamentally different.

[*Continued on page 262*]

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ONLY **$36.50** Less motor

Favorite of home owners and craftsmen for 20 years! SPEEDY SPRAYER gives your work that professional paint finish everyone admires. Sprays paint, enamel, varnish, lacquer, etc. . . . 4 to 7 times faster than hand brushing! Lightweight, portable, uses any ¼ H.P. motor. Improved diaphragm principle assures clean, oil-free air. You'll find dozens of time and money saving uses for SPEEDY SPRAYER, including spraying insecticides 2-4-D and DDT. Complete outfit, without motor, only $36.50

At leading hardware, lumber, and auto supply dealers.
FREE—*write for handy booklet "How to Spray."*

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Now You Can Have

A Dry Basement

with beautiful colored walls and floor

PLASTEX gives long-lasting protection against water. Also bright, colorful, easily washable walls and floors. Basements painted with PLASTEX in 1939 are still dry and attractive. Water up to 10 ft. has been successfully kept out by PLASTEX.

PLASTEX is not a water mixed material. It is formulated of synthetic resins especially to resist water pressure. The hard glossy PLASTEX finish is not easily soiled.

PLASTEX is also excellent for use in kitchens, bathrooms and for interior trim—where resistance to water, grease, etc. is necessary. PLASTEX is available in many colors making possible lovely color combinations. Easily applied by brush.

Color chart and complete information will be sent on request.

PLASTEX

Steel Protection & Chemical Co., Inc.
953 Bridge St.
Mooresville, Indiana

This is a Syncro Electric Jig Saw

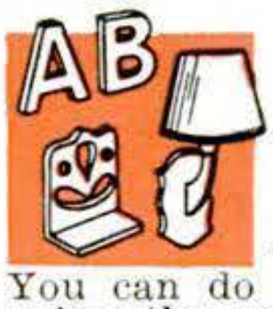
It's a Complete Unit in Itself. You can carry it home under your arm, set it on a table or workbench, plug it in, and proceed to work on it.

Now this blade gives you 14,400 smooth strokes per minute, just about 5 times as fast as the ordinary jig saw blade. It is especially well suited to delicate fret saw work and it always cuts that smooth edge that requires no sanding. This last feature alone will save you many hours of time which you would ordinarily spend sanding such things as what-not shelves, magazine racks, fern stands and the many other things that you will like to make.

You will find that all the forests of the world are right at your elbow to provide you with rare and beautiful materials for your handicraft. But even with that, you are not limited to wood. Plastic materials are now appearing in a large variety of colors.

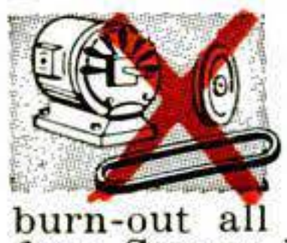
For instance, catalin, a molded plastic. It is comparatively easy to work on this jig saw and takes a beautiful polish. Not quite so easy to work, however, as bakelite. Bakelite, for a cast plastic, is hard and brittle and the ordinary saw cuts kind of a splintered or split edge on it. But the high speed and the fine teeth in these Syncro blades always insure a clean cut. You will find that these various plastic materials are particularly nice for working out such things as monogram pins, belt buckles, picture frames and wall lamps.

Now comes the best news of all. Parents especially are glad to know that here is a power jig saw that is safe also for boys and girls to use. Accidental injuries on this machine, even the slightest cuts, are very rare. Serious injuries are impossible. Now that may seem strange to you but the reason is very simple . . . the Syncro blade does not "pull" the "work" or finger towards it as belt-driven jig saw blades do.



If you happen to have seen a Boy Scout Troop doing handicraft metal work, you will always find a jig saw one of their main tools. Perhaps you have various ideas that you would like to work out in metal; a name plate out of aluminum, a shadow lamp out of copper, or book ends out of brass. You can do all these things on this same machine using the same one blade to cut all those different types of metal, as well as wood, cardboard, etc.

And remember that you can do all these things without a great deal of expensive equipment. Actually with only one machine—one jig saw and one blade—one saw you can carry home under your arm, plug it in and go to work on it.



It comes complete with 6 blades and there is nothing else to buy. No belt, no pulley, no motor, or anything else. It is all complete (including built-in motor) in this one unit. The built-in power unit is also guaranteed against burn-out all during your ownership or is replaced free. Syncro is a precision-built, UL-Approved, durable tool, and will last a lifetime. Syncro electrical precision products have been made for 30 years. Your hardware dealer should have one on display.

However, if he is out of stock or no store is near you, send only $24.95 direct to Syncro Corporation, Dept. G-93, Oxford, Michigan, and your Syncro Jig Saw No. 201 will be shipped to you postpaid. Use it 10 days, then if it does not please you 100%, return saw postpaid to Syncro and your money will be promptly refunded. Or send postcard for Free Circular of Syncro Saw and Syncro Sanders.

100%

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Power plant *in a hairpin...*

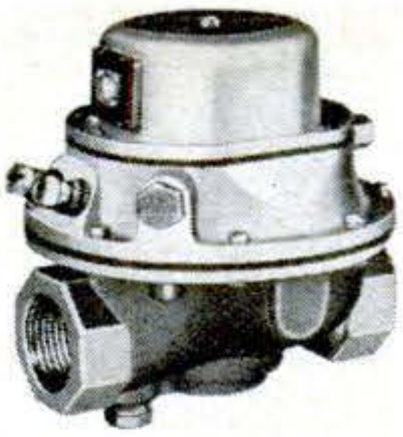
This scientific phenomenon is literally true. When two dissimilar metals are joined together at one end, and that end is heated, a measurable electric current is produced. This is the thermocouple principle; its use means much in gas heated homes.

In the General Controls B-60 self-powered gas control system the pilot generator amplifies this thermocouple principle into sufficient power to operate the on-off gas valve and the *automatic* room thermostat. To hundreds of thousands of home owners this General Controls system means accurate, dependable heat control of their home, *automatically,* without dependence on outside power sources. The system is whisper-silent and absolutely safe. The handsome room thermostat maintains room temperatures that are just right for your family.

ROOM THERMOSTAT

PILOT GENERATOR

Your heating dealer will explain the low-cost installation of General Controls B-60 gas controls and point out that fuel economy will reduce heating bills. Check with him today if low-cost automatic heat is a problem, or write for the free B-60 folder. You'll find the nearest General Controls factory branch in your local classified directory.



B-60 GAS VALVE

GENERAL CONTROLS

Glendale, California • Skokie, Illinois

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications.

FACTORY BRANCHES IN 34 PRINCIPAL CITIES

See your classified telephone directory.

Detroit's Newest Basket of Gears

[Continued from page 260]

Chrysler claims that it pondered long and experimented hard before it froze A323. Lock-up into direct drive, for example, was discarded only after considerable study, partly because it added weight, complexity and cost, partly because it "flattened out" car performance at medium speeds, where an unlocked converter can give extra perk to a car. In A323 the converter will "couple"—come within a few percentage points of being locked—at light throttle at 30 or 35 m.p.h. But when you feed the engine more gas, the converter will unbutton and multiply torque, the amount in proportion to what you demand. At 50 and above she couples even at full throttle.

A323 has been in development for eight years, and except for tooling and production headaches might have been in the salesrooms last winter. Chrysler says that the reason it has been slow to bring out a fully automatic drive is that the company wanted to make it a really good one. This is probably accurate; certainly A323 bears marks of intensive engineering.

Whatever the history, Chrysler's in business with an impressive new drive. —*Frank Rowsome Jr.*

Shoptalk:

"THIS GUY SAID HE WAS RIGHT IN THE MIDDLE OF A WEATHER FACTORY WHEN HE PUSHED THE ELEVATOR BUTTON."

What are they talking about? Where do they work? Answer below.

The speaker is a mechanic at an Air Force Base. He is telling about a pilot who was in the center of a thunderstorm (weather factory) when he bailed out by using the ejector-seat release (pushed the elevator button).

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A PROFESSIONAL PRECISION TOOL!

8" TILT ARBOR* SAW

CUTS 2 x 6's IN 2½ SECONDS

ALL METAL

*Patent Number 2590035

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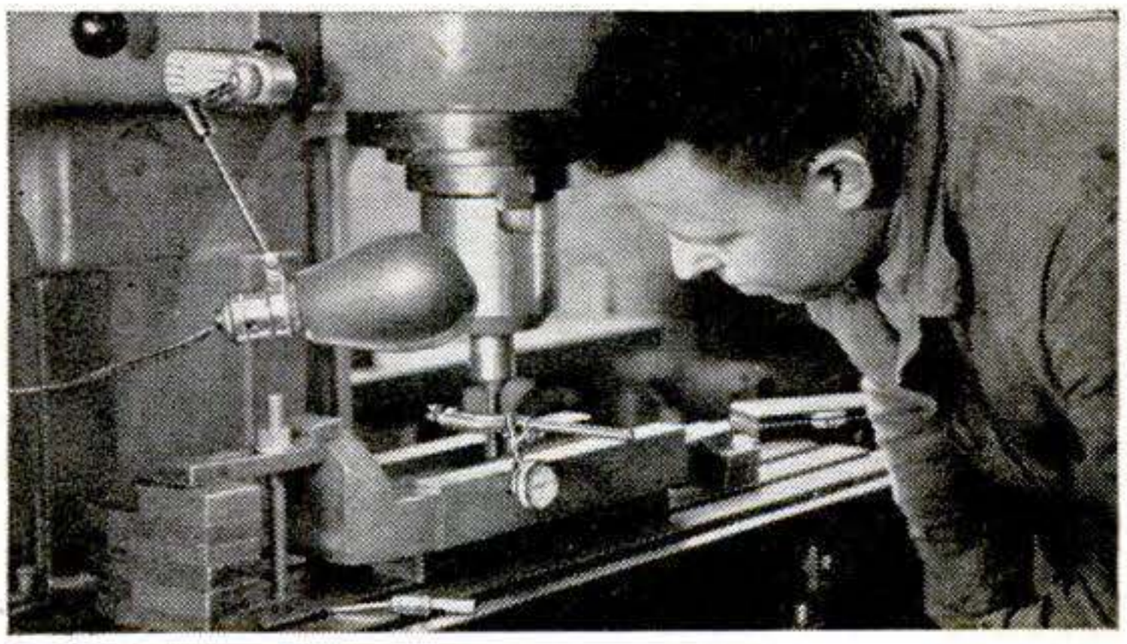

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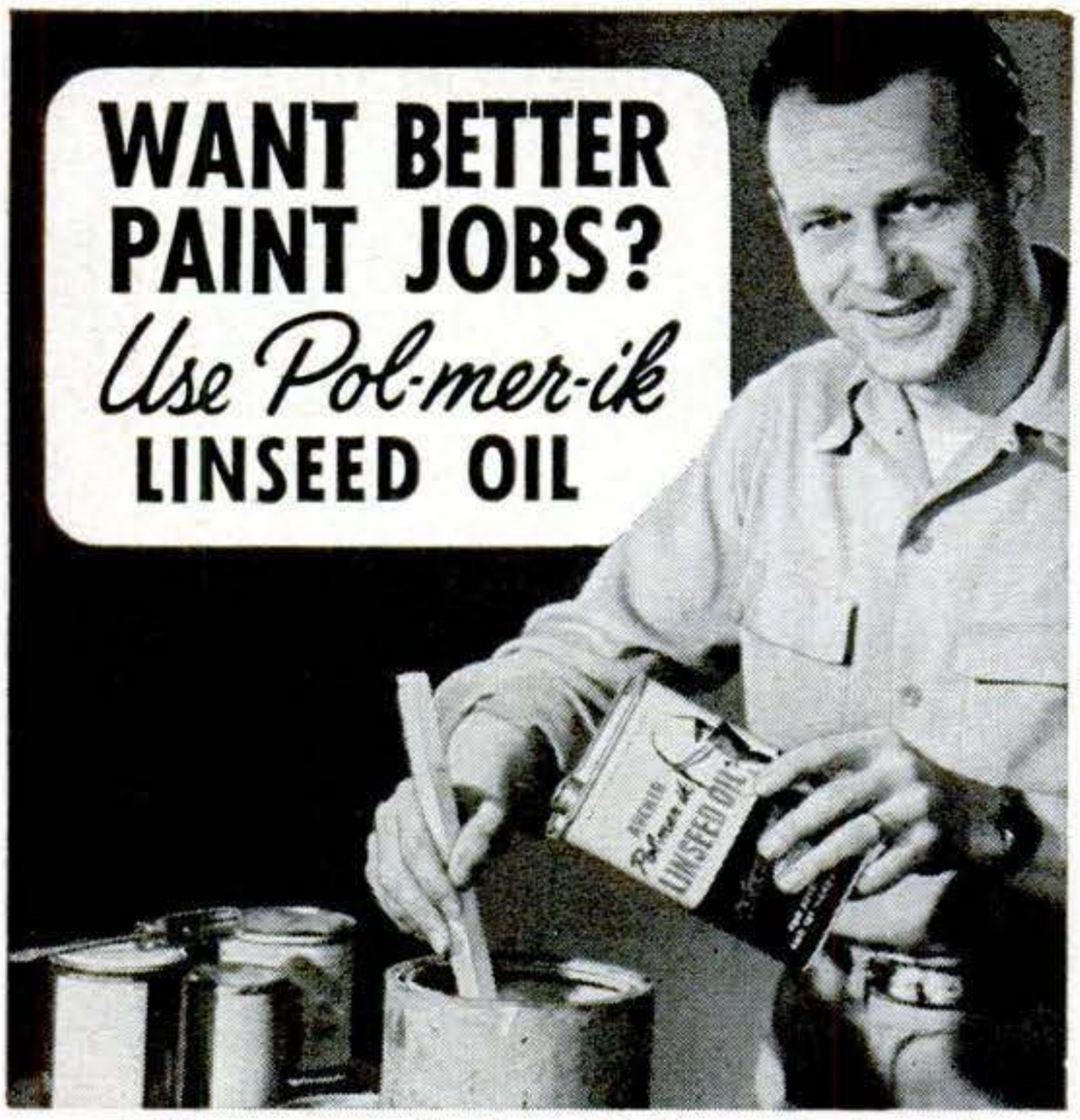

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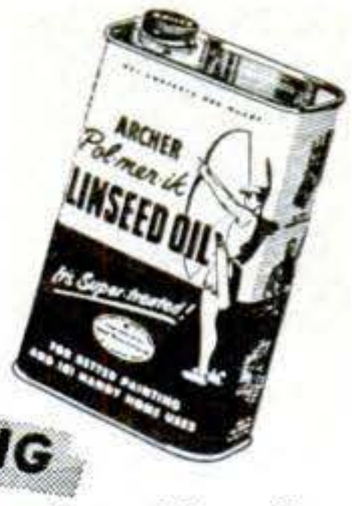

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They Sink Fortunes in Auto Tests

[Continued from page 130]

administrative staff and an analytical-report section. Fit out and staff a machine shop, instrument shop and electronics shop. Build up 24-hour medical and police details. And now you are about ready to start testing cars on the Detroit scale.

What Do They Do?

Proving-ground duties vary a bit, but generally the work divides up this way: 1) endurance runs of current cars, both your own and competition's; 2) intensive wringing-out of next year's models; 3) testing of engines and parts ticketed for production several years into the future; and 4) running special checks for groups within the company like Transmissions or Styling.

Tucked into this general framework are extra jobs too. These may involve spot checking the manufacturing division; doping out how the competition saved a buck; helping the service department run down a bug; feeding useful tips to Sales; impressing visiting V.I.Ps.

But the main business of a proving ground is the production of reports—handsome documents with multicolored graphs that are sent out to limited lists of people within the company. These reports are handled with the ritual accorded bombsight blueprints; only a few dozen are printed and numbered copies are delivered by messenger, with return receipt requested. This writer, delighted with an impressive GM report that analyzed getaway performance of all U. S. cars, asked a proving-ground engineer how he could obtain a copy.

"The best way I know," the engineer remarked, "is to grab this one and shoot your way out of the gate." END

Next month: What do proving grounds really prove? How come they occasionally muff one? What accounts for "lemons"?

How True

MOST people won't drive a car that looks old enough to be paid for.—*Indiana Tele News.*

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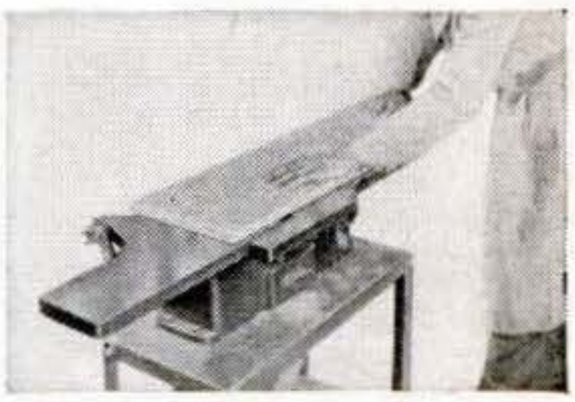

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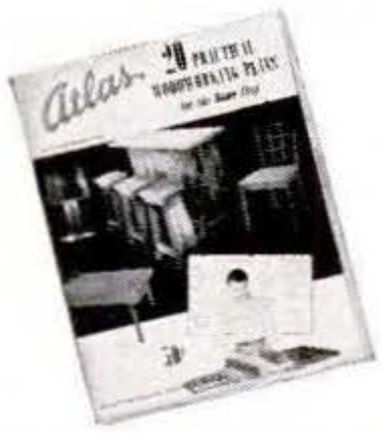

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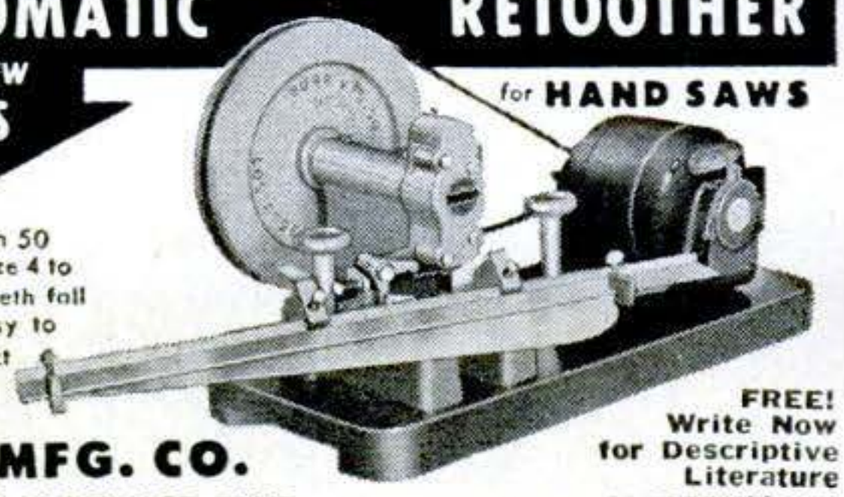

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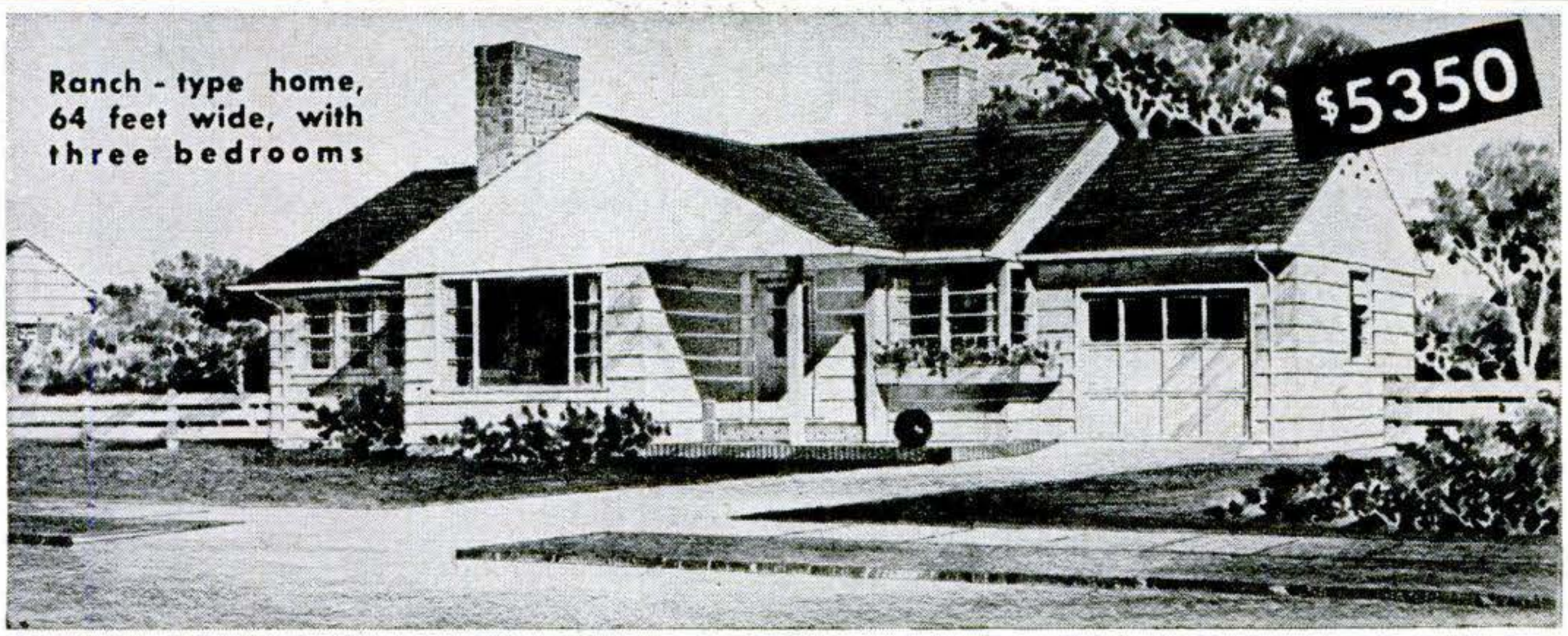

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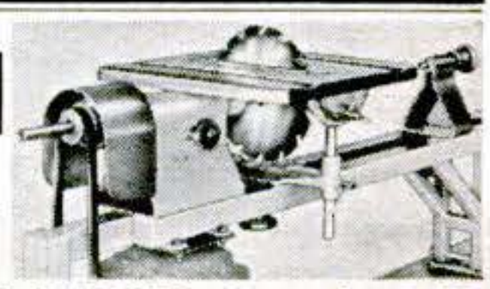

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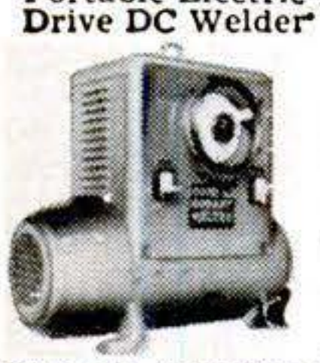

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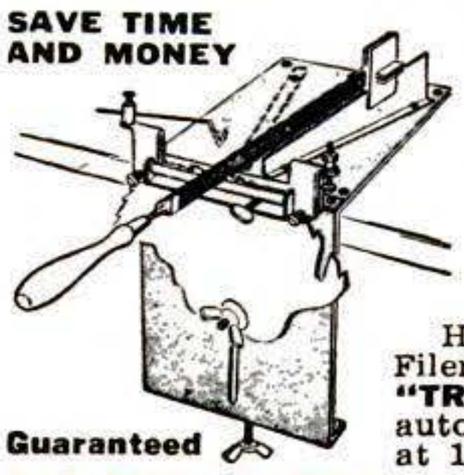

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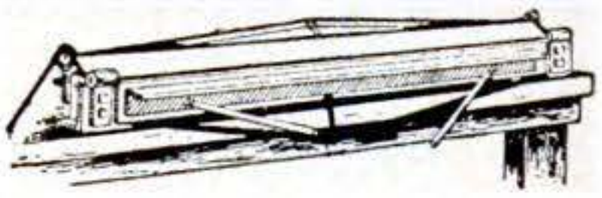

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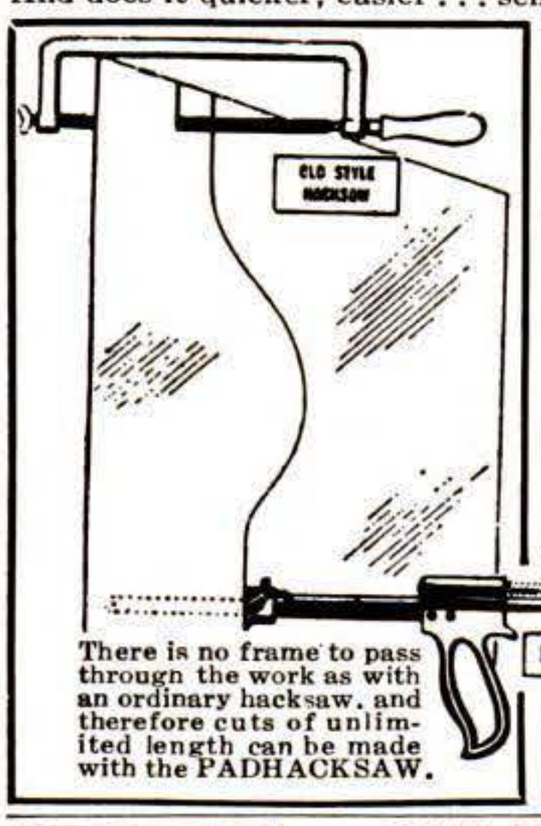

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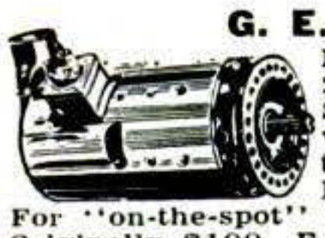

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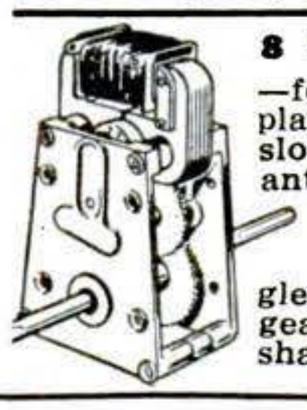

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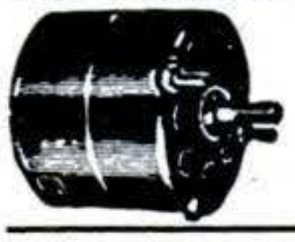

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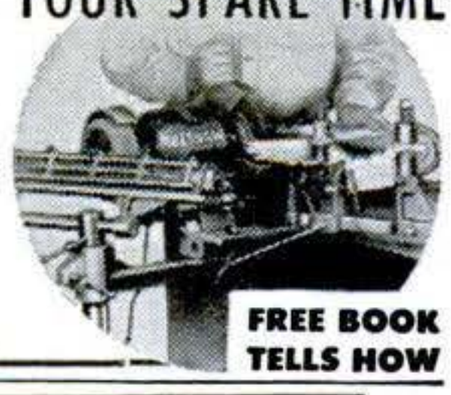

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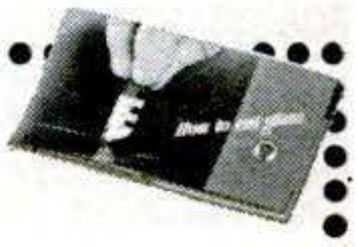

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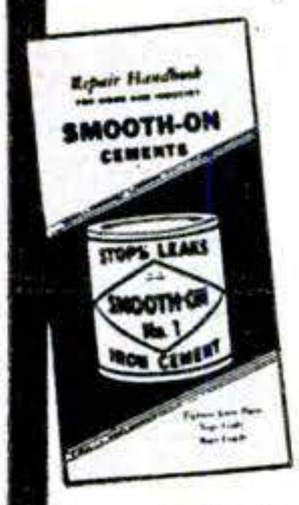

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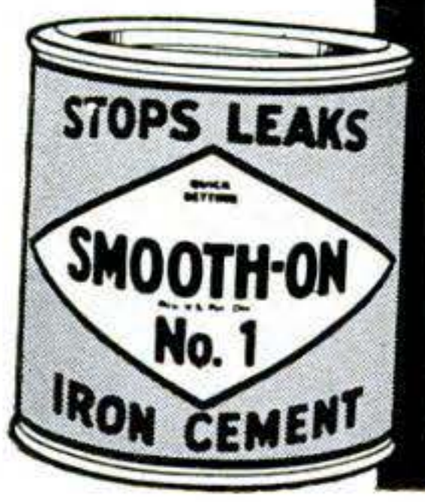

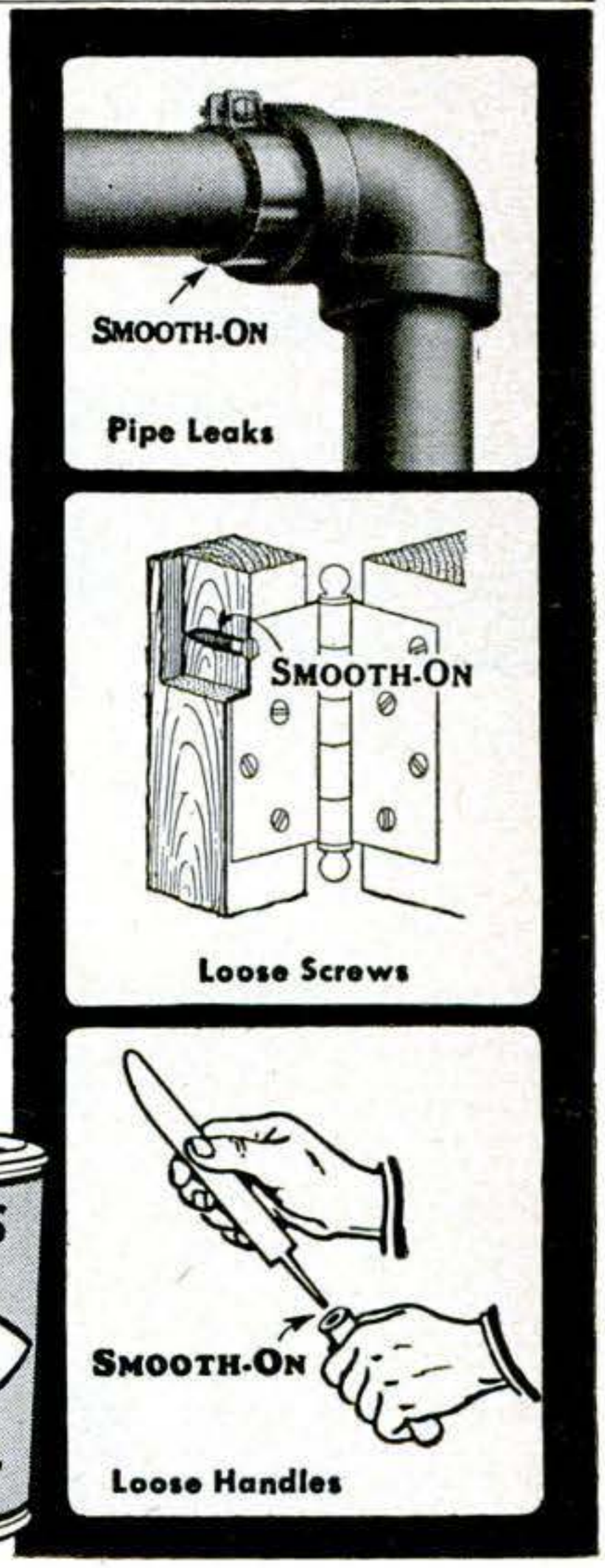

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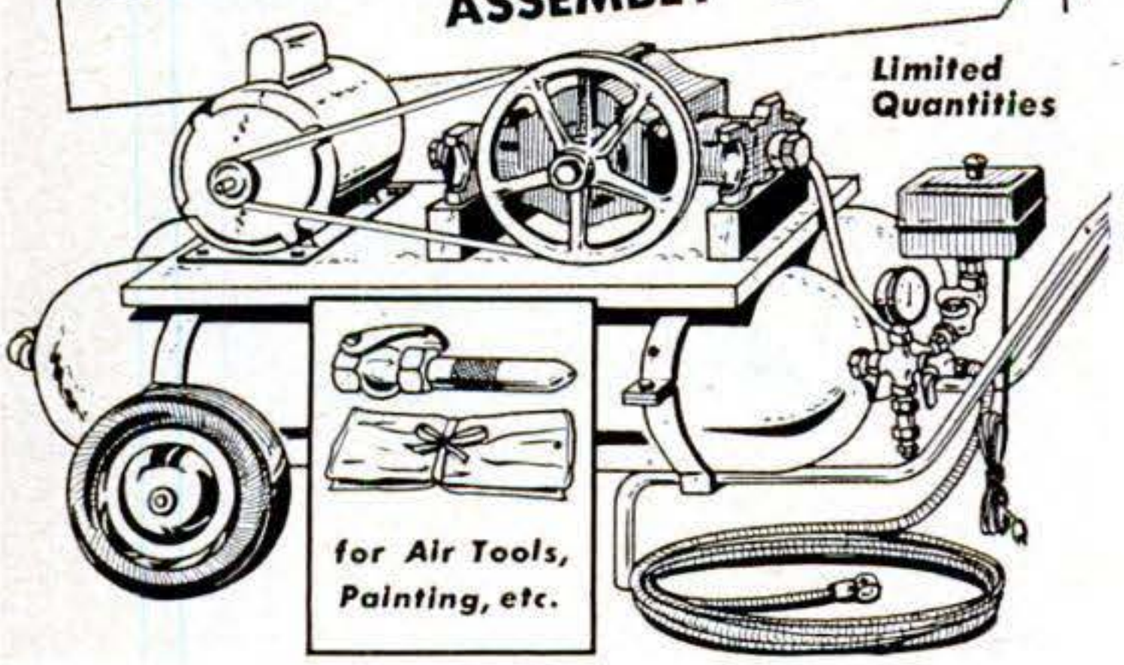

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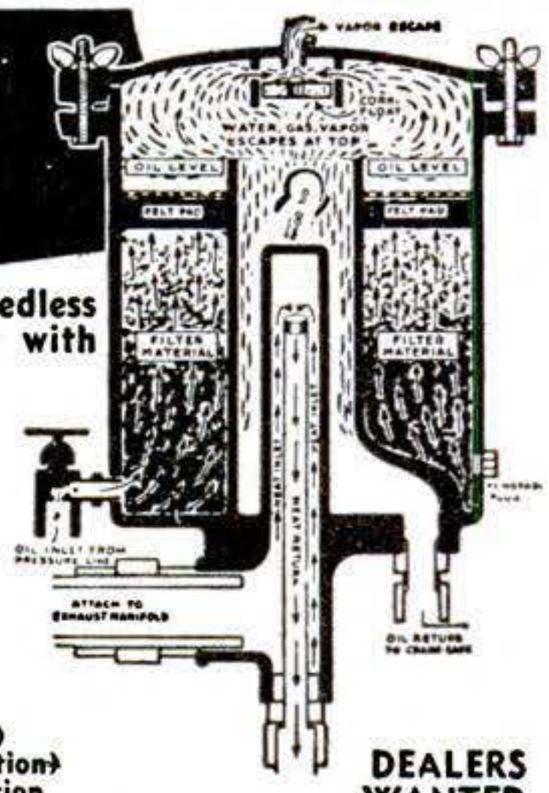

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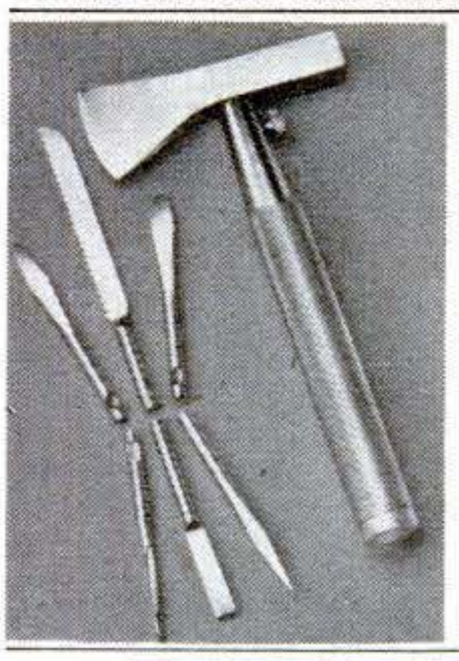

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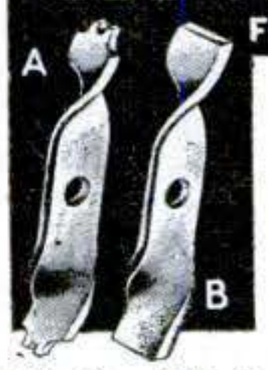

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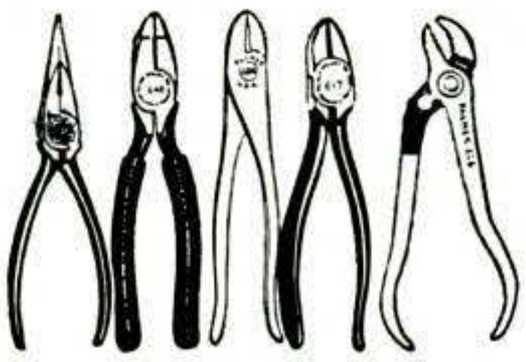

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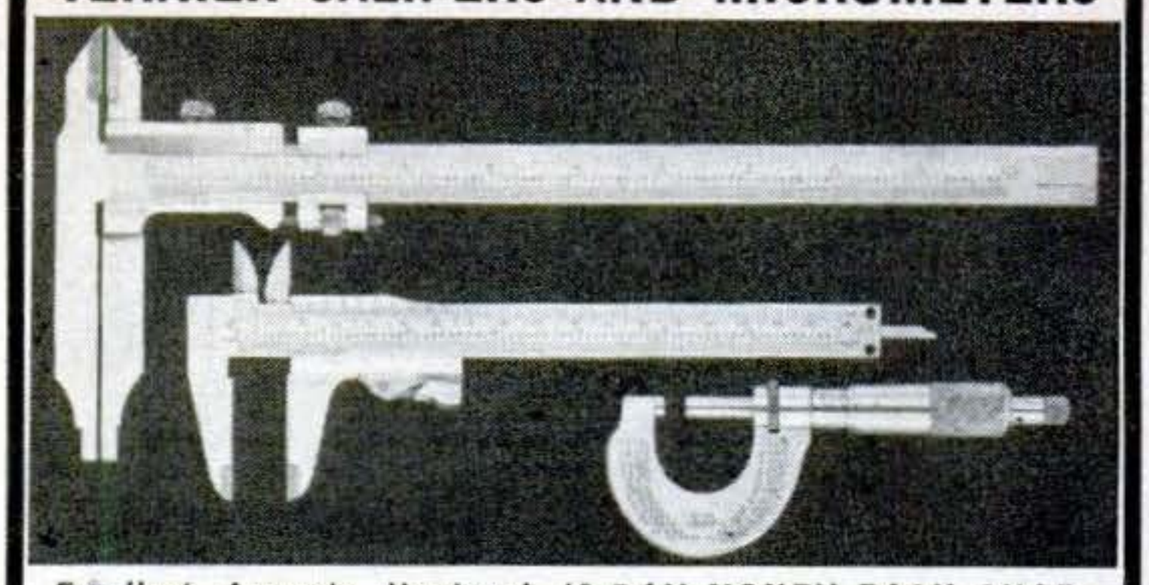

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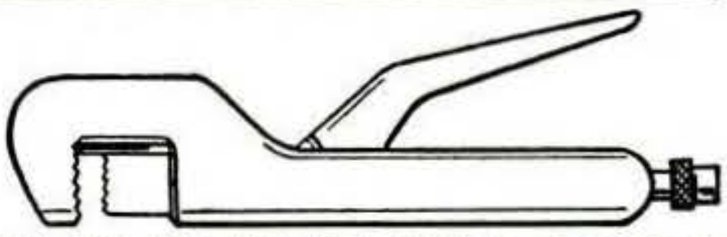

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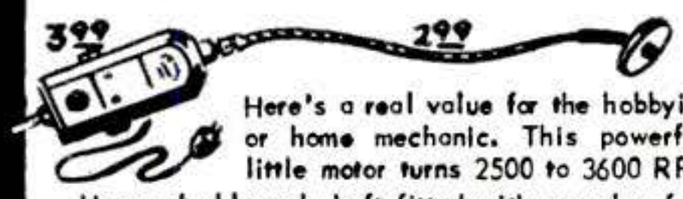
BARGAIN HOBBY MOTOR



Here's a real value for the hobbyist or home mechanic. This powerful little motor turns 2500 to 3600 RPM Has a double-end shaft fitted with an arbor for mounting small stones, wheels, buffers, etc. and a hand chuck for 3/32" and 1/8" shanks. MOTOR complete with arbor & chuck --- 3.99

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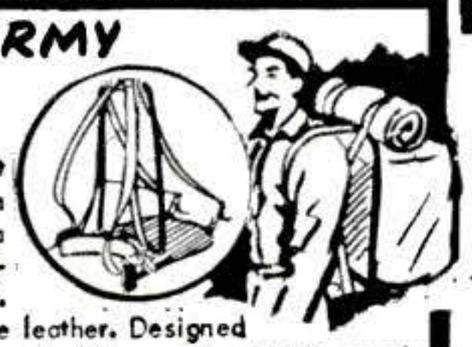

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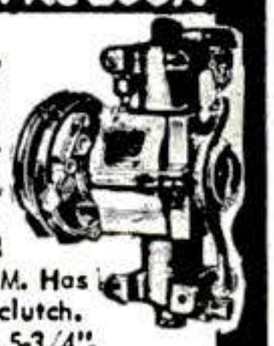

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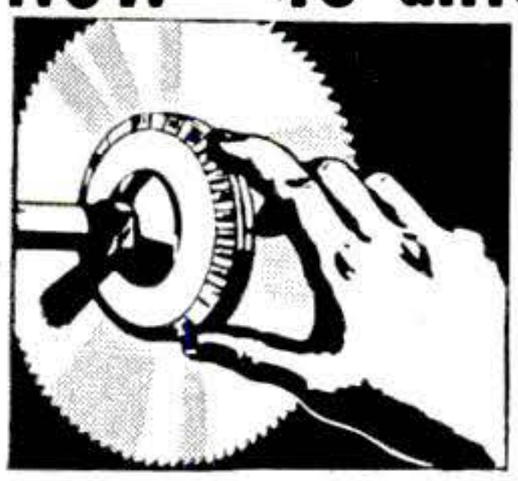

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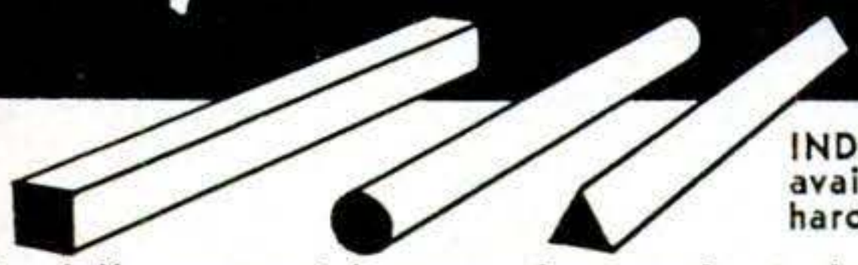
sharpen that countersink



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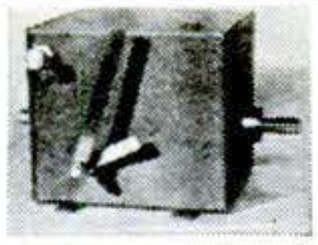

It has Infinite Speeds 0 to 550 Reverse Automatic Overload Protection; Adjustable Torque up to 180 inch pounds. 5/8" Input and Output Shafts. It will handle 1/4 to 1 1/2 H.P. Motor. Case measures 7 1/2" long 7" high 6 1/2" wide. VALUE OVER $300. Shipping Wt. 25#. On C.O.D. Orders we require a 10% Deposit.

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VISE-GRIP WRENCH

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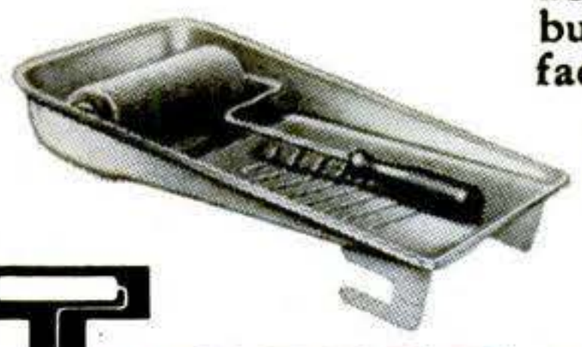
THOMAS Paint Rollers apply *all* paints beautifully...on walls, ceilings, floors, fences, boats, farm buildings...on *any* surface, inside or out.



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EDITORS' IMPARTIAL TESTS PROVE:

New Self-Charging Battery Outlasts, Outperforms Others 221%

A few months ago, we started producing a new battery which we frankly believe to be many years ahead of its time. When we announced that this new battery developed 15 amperes more power than other batteries and would automatically bounce back to life again and again after being deliberately and completely discharged, technical editors of leading magazines raised their eyebrows.

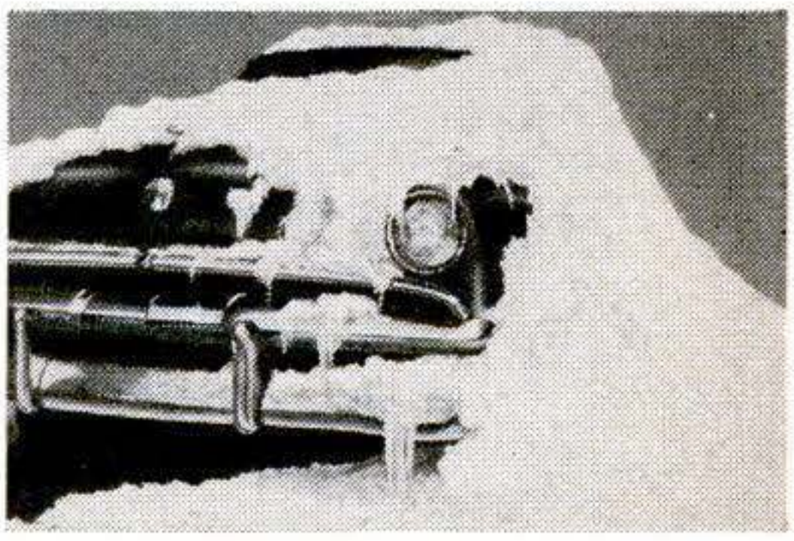
When we added that we had named it the *Life*time Battery because of its *life* (meaning exceptional power) and the *time* it would last (3 to 4 times as long as ordinary batteries), and that we guaranteed it for *six years*, these editors were understandably doubtful, to put it mildly. One publisher, in fact, refused to accept advertising for this battery until what he then considered to be our extreme claims were carefully tested.

One of the editors said: "Let us test this battery, any way we see fit. If it does what you claim, it's news our readers will be interested in. If it's no good, our readers will be interested in that, too, and that's the way we'll write the story." We said "go ahead" and they took a standard *Life*time Battery off the production line and went to work.

You may have read the result of the first test in a famous automotive magazine (name on request). Using two well-known batteries (possibly the best-known high-quality batteries in the world) for comparison, they first ran the *Life*time Battery down completely and let it re-charge itself automatically. They repeated this test 43 times the first day, then compared its strength with the other two batteries. Results: the *Life*time Battery was 204% *stronger* than the *strongest* of the other two batteries. They discharged the *Life*time Battery another 20 times, allowing it to re-charge itself automatically each time, and compared all batteries again: the *Life*time Battery was now 213% stronger than one battery, 221% stronger than the other! Next, they put a punishing 300-amp load on the *Life*time Battery; it survived that in good shape. So they repeated the self-recharging test again and finally concluded: "... unprecedented life expectancy ... remarkable recuperative characteristics ... outperformed the others in every respect and by a comfortable margin ... an outstanding value."

The editor of another magazine (name on request) heard about the tests and asked to "give the thing a *real* test, one that would burn up the average battery." We gave him the *same battery* and challenged him to "finish it off." He installed it in his own car and drove the car on the *battery alone*, shifting gears as he would normally, until his "fingers were sore from holding the starter key ... I hate to admit it, but I was outlasted by a battery."

Still another editor wrote: "... definite battery improvement ... greater recuperative power, greater initial output... obviously high quality."



During independent tests in Alaska and the U.S., the Lifetime Battery was intentionally discharged under sub-freezing conditions, recharged itself automatically & started car at once!

Engineered for Cold Climates

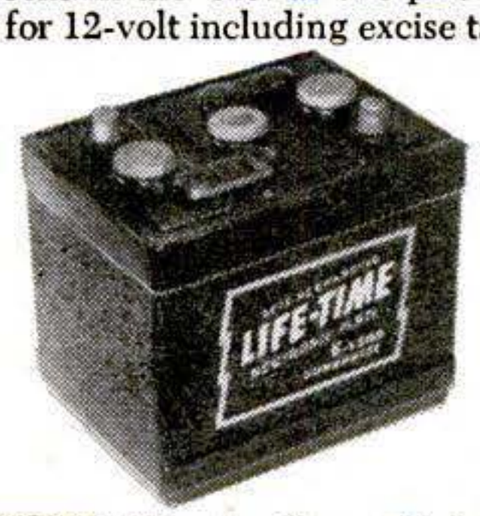
Soon after the *Life*time Battery went into production, we selected a few dealers in northern U.S. and Alaska, shipped them a few batteries and waited to see how the dealers and the public would react. Our Alaska dealer told us that before presenting it to his customers, he was going to give the battery an Arctic test: discharge it completely then freeze it at 30 below zero for 72 hours. Result: the battery had recharged itself and immediately started the car. Immediately we received a telegraphed order from Alaska for $6,043 worth of *Life*time Batteries!

6-Year Guarantee Saves You Up to $107

The average deluxe battery lasts 1.4 years at a typical cost of $25.00, or $107.00 for a 6-year period. This arithmetic is making sense to people who are tired of throwing money away on batteries that just won't hold up. We believe it will make sense to you, too —particularly since the *Life*time Battery you buy now can easily be transferred to your new car whenever you trade in.

12-volt and 6-volt Available

Here's more arithmetic that makes sense. the *Life*time Battery sells in the U.S. at one price for all cars· $29 95 for 6-volt, $34.95 for 12-volt including excise tax.



Supply Limited: Order Today by Mail!

Although plant facilities are being expanded, supply is still limited. If your dealer can't supply you, order direct by mail from the factory; we pay freight.

CONTINENTAL MANUFACTURING CORPORATION (Marketing Division, Consolidated Engineers)
Dept. BS-9, Washington Boulevard at Motor Avenue, Culver City, California

Dealers NOW BEING APPOINTED TO HANDLE DEMAND

Dealerships are now being awarded to take care of demand generated by $1,000,000 advertising campaign plus articles in national magazines. Write today for full information, including reprints of editors' tests and case histories from present dealers.

Continental Manufacturing Corporation, Dept. BS-9
Washington Blvd. at Motor Ave., Culver City, Calif.

Please ship *Life*time Battery at once:
☐ 6-volt ($29.95 including tax)
☐ 12-volt ($34.95 including tax)

for_____
(make, model, year of car)

☐ I enclose cash, check, or money order: you pay shipping cost.
☐ I enclose $5 deposit, will pay balance & shipping costs C.O.D.

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ELECTRONICS BUYING GUIDE

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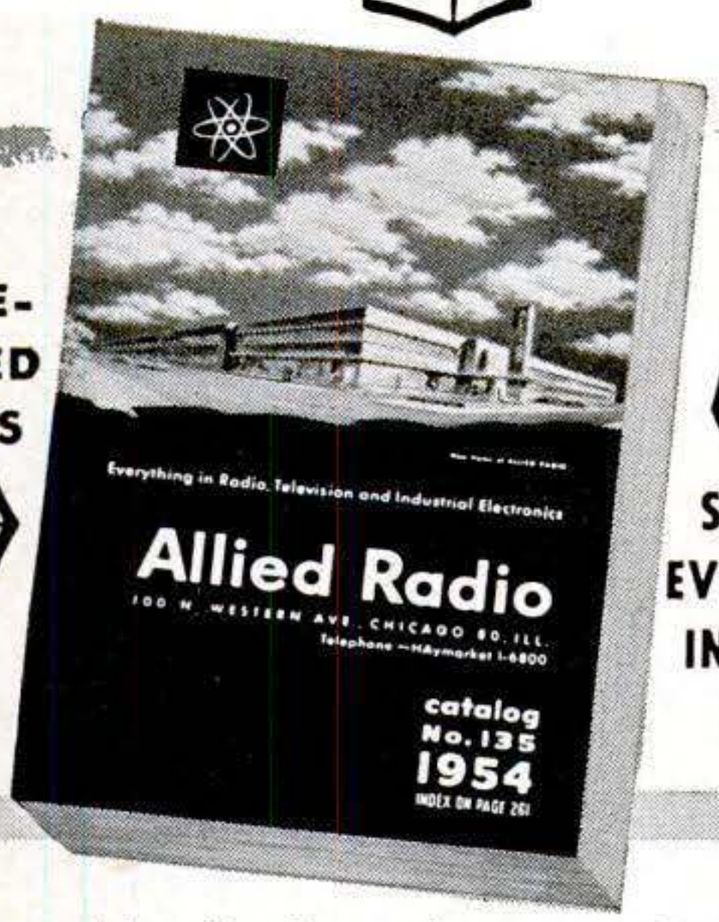

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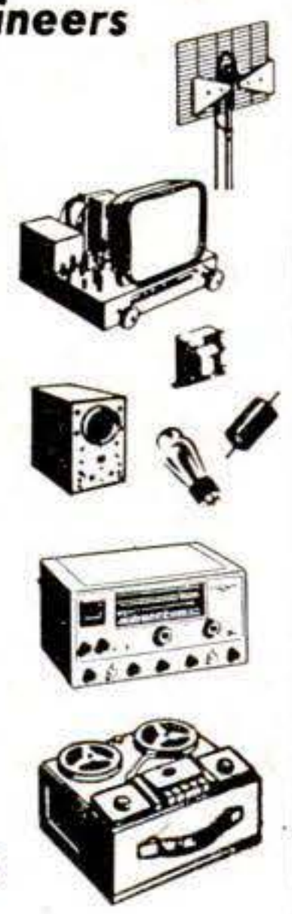
Everything for Experimenters, Builders, Amateurs, Servicemen, Engineers and Soundmen . . .



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☐ Rush FREE 1954 ALLIED 268-Page Catalog

*Name*_____

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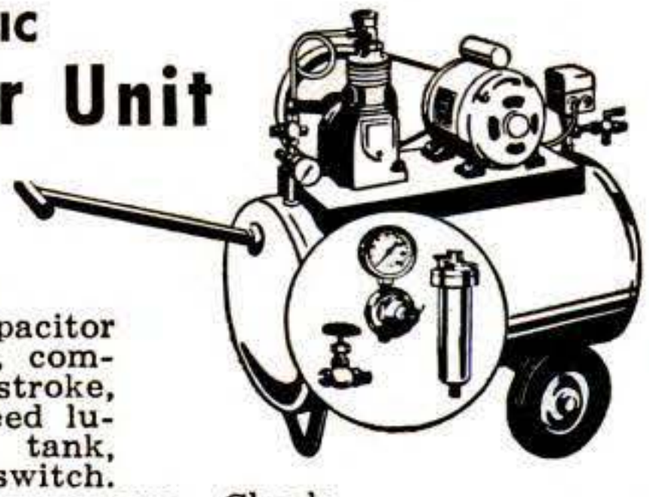
AUTOMATIC

Compressor Unit

with

22 Gal. Tank



1/3 H.P. heavy duty capacitor motor. 110 volt A.C., compressor 2" bore, 1 3/4" stroke, piston type, splash feed lubrication, 14" x 32" tank, automatic pressure switch. CFM 2.8 at 100 lb. pressure. Check valve, safety valve, air regulator with gauge and filter, 20 ft. air hose with air chuck for inflating tires. V. belt drive. Ball bearing wheels, with 2" x 8" rubber tires. Portable with handle. Ship. wt. 150 lbs.

With 1/3 h.p. motor Reg. price $175 **$98.50**

With 1 1/2 h.p. gas engine Reg. price $200 **$124.50**

Regulator, gauge and filter sold separately. Price for the 3 items . . . **$8.95**

PRICES F.O.B. CHICAGO. MONEY BACK GUARANTEE. SEND CHECK OR MONEY ORDER TODAY. PROMPT SHIPMENT. **WRITE FOR OUR CATALOG. SEND 10c FOR POSTAGE.**

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1953 EDITION JUST OUT!

World's largest Auto Accessory & Parts Catalog. Over 50,000 items:—Hollywood Accessories. Hi-Speed Equipment. Rebuilt Engines, Everything for all cars & trucks. We have that Hard-To-Get part. Jam packed with bargains. Completely illustrated. (134 pages). Send 25c (Refundable).

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ELECTRIC WELDER

AC or DC 110 Volts

The "Little Marvel" all-metal welder. 5-year written guarantee. Welds 1/8" metal or money back. Repairs tanks, tools, fenders, machine parts etc. Complete with everything—rods, unit, eye shield, directions. $6.45 plus 50c postage. Flame torch accessory for soldering, cutting, brazing $3.95 complete with carbons, brass rods, flux. Sorry, no C.O.D. Buy direct and save.

$6.45 Complete

ESSAY MFG. CO., Dept. 47, Quincy 69, Mass.

GOLD-SILVER-COINS

Easily located with new Lightweight M-Scope Detector. Superior performance, lowest price, monthly payment plan.

FREE LITERATURE

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PALO ALTO CALIF.

YOU CAN DRILL ANY SIZE HOLE UP TO 1/2" WITH YOUR PRESENT 1/4" CAPACITY POWER DRILL.

NOW AVAILABLE

FOR THE FIRST TIME . . .

The COMPLETE SET of CHROME SPEED HI-TEST TWIST DRILLS —ALL 29 SIZES . . . from 1/16" to 1/2" . . . with Shank diameters limited to 1/4".

This complete set for a low-low At NO EXTRA COST a pouch, specially designed for this set is included. **9.98**

Ship. chge 40c

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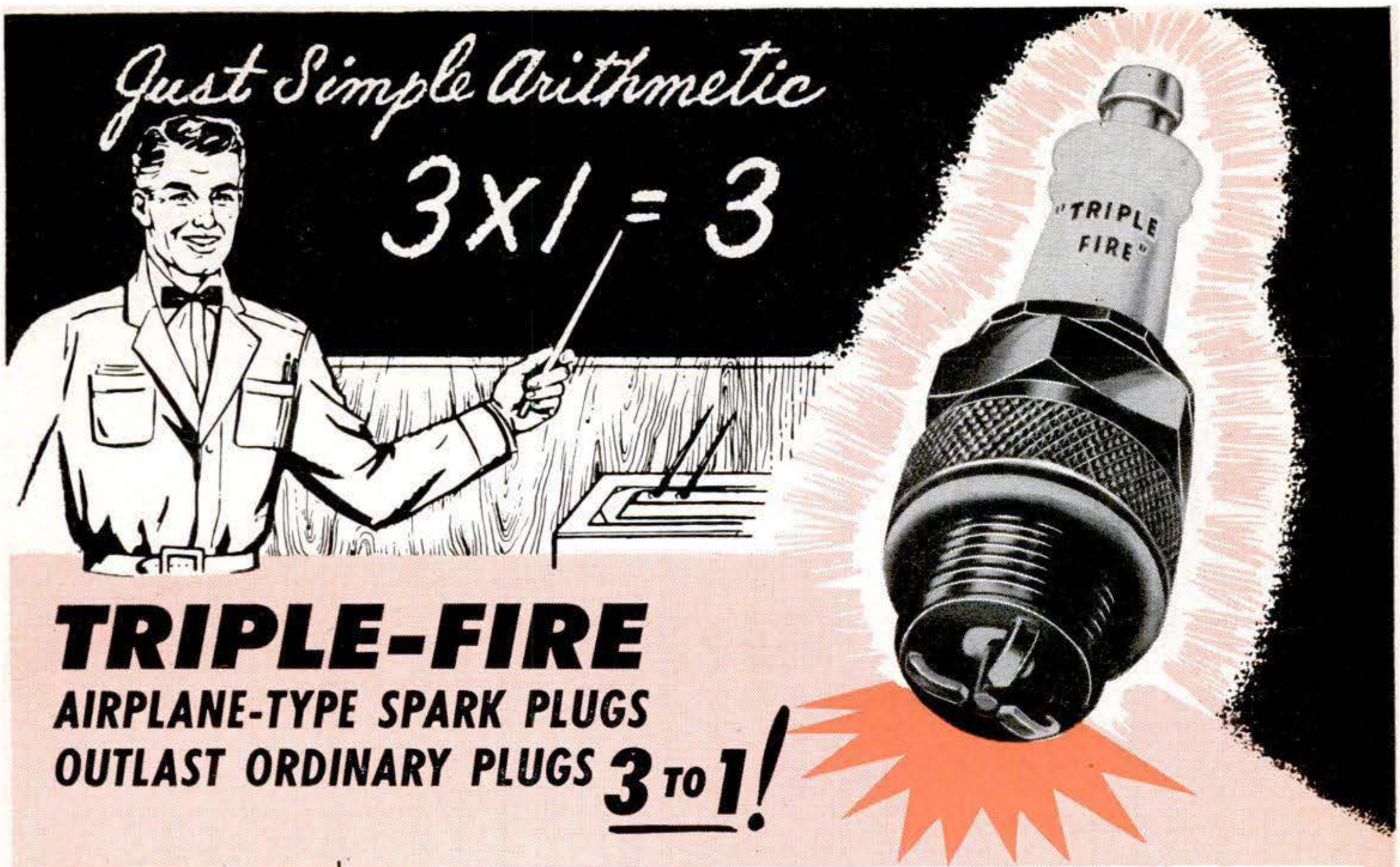
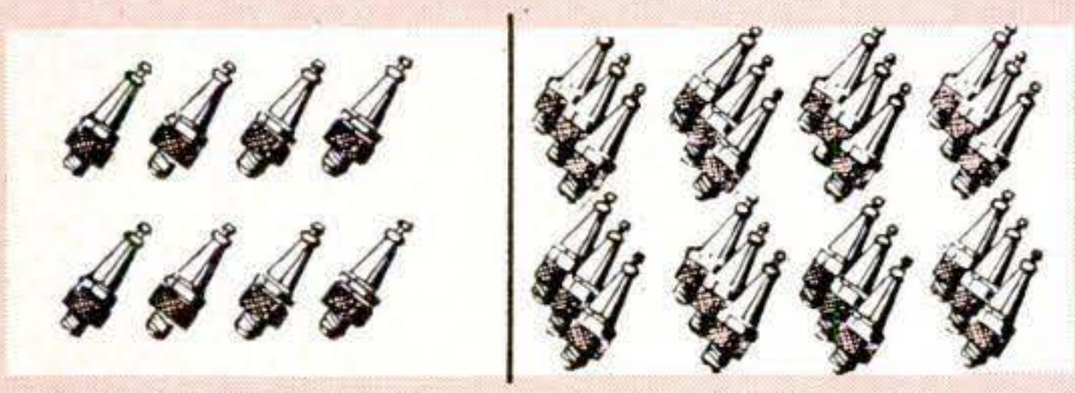
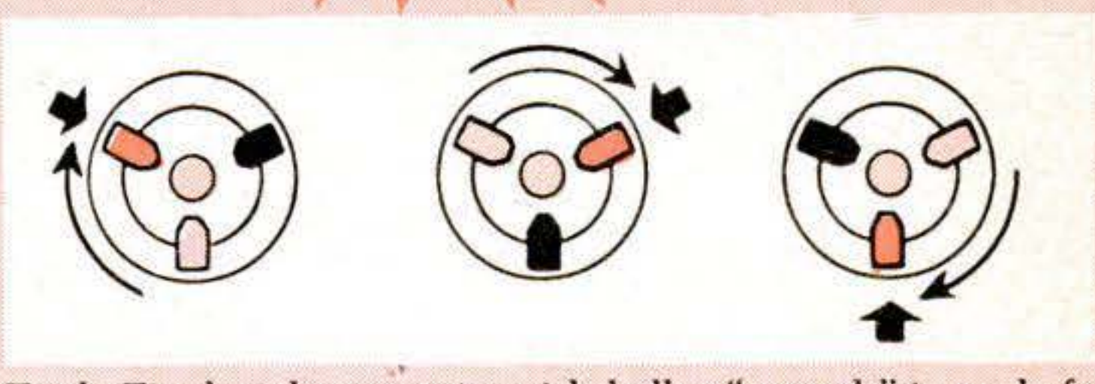


TRIPLE-FIRE

AIRPLANE-TYPE SPARK PLUGS OUTLAST ORDINARY PLUGS 3 TO 1!



On the left is a set of ordinary spark plugs. On the right, you see a set of Triple-Fires for the same car, showing for comparison, the triple service you get from each plug. Triple-Fires are priced with other first line plugs—yet they out-perform and out-last other plugs 3 to 1, actually saving you up to $13.20 per set. And here's why—



Triple-Fire has *three* genuine nickel-alloy "grounds" instead of a single steel one. Each spark heats its ground point, momentarily raises its resistance, and causes the next spark to seek a different gap. The three points thus fire in perfect rotation. Triple-Fires hold adjustment three times as long—are three times as reliable as other plugs.

All Triple-Fire Plugs feature the famous Lifetime Cardo insulators. This material, first developed to meet the vital high-speed requirements of fighter aircraft in World War II, resists heat, tetra-lead shorting and etching, and absolutely eliminates the high-temperature fractures which cause frequent failure of old-type ceramic insulated plugs.

Triple-Fires climax 15 years of intensive research, and production experience. Gruelling 50,000 mile tests on road & track, and continuous laboratory "breakdown" tests prove Triple-Fires 3 to 1 superiority over other first line plugs. That's why the makers of Triple-Fires back their claims with a guarantee *no other manufacturer dares match!*

UNCONDITIONALLY GUARANTEED FOR 20,000 MILES!

(covers defective material or workmanship)

ORDER BY MAIL TODAY!

ORDER BY MAIL TODAY! Triple-Fires are furnished in perfectly matched sets for 89c each (single plugs 98c each) Shipped postpaid or send $1.00 per set deposit; balance C.O.D.

DEALERS: Choice territories available; write on your letterhead today for complete information.

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ENGINE PRODUCTS MFG. CO. Dept. 74
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Please ship_____sets of Triple-Fire Spark Plugs for:

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NAME_____

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CITY_____ZONE____STATE_____

☐ *Check Enclosed; Ship Postpaid*

☐ *$1.00 per set Deposit Enclosed; Ship C.O.D.*

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[Continued from page 168]

200-mile winds certain to follow. Within a few hours the killer hurricane would beat Bermuda to death, it appeared.

But at the same hour, five in the morning, Fox caught up with Easy. The chase that had begun 4,000 miles away ended at Bermuda's doorstep.

Like a boxer rushing in with a surprise blow Fox knocked Easy off its course. Their winds meshed and the two hurricanes were locked, but they did not become one as people had feared. Instead, they roared, whirled and circled in a fantastic dance. Then Fox sped away toward the northeast, and Easy veered off in a wide arc. When last seen by watchers on the island both hurricanes were moving at high speed along separate routes out into the Atlantic.

Rescue Seemed Miraculous

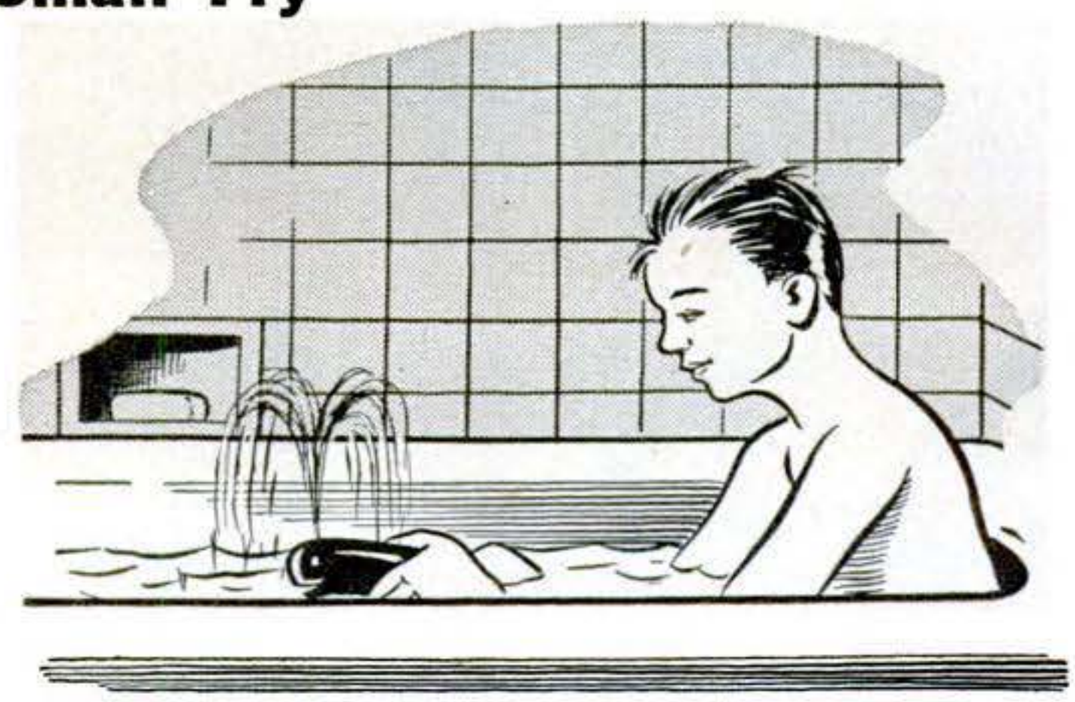
One hurricane had saved Bermuda from the fury of another. The timing had been incredibly close. In a matter of minutes Bermuda would have been struck by the heaviest force that nature had ever manufactured out of air and hurled against man. It is understandable that those who prayed believed that their prayers had been answered.

As to Easy and Fox, they soon reached regions where the air was cool and no longer furnished enough heat and humidity to keep them going. Their winds abated; their torrential rains died down to a drizzle. Days later there was nothing left of them but a few patches of clouds, a few swells on the surface of the ocean. END

Right on Time

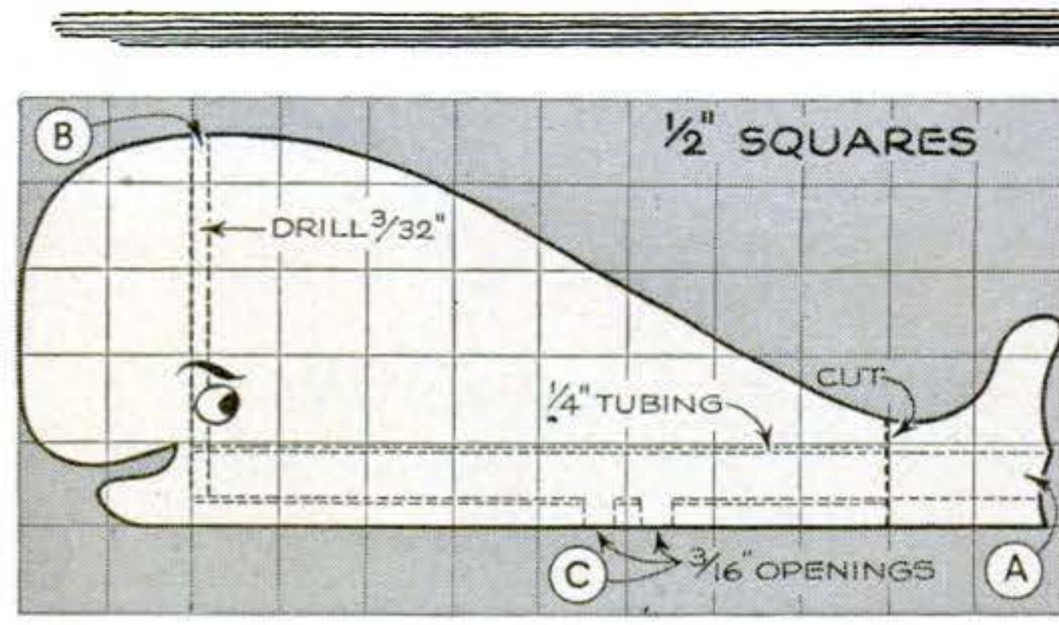
Sylvia: "When I applied for a job the manager had the nerve to ask me if my punctuation was good."
Mildred: "What did you tell him?"
Sylvia: "I said that I'd never been late for work in my life."—*The Kablegram.*

Bathtub Moby Dick Spouts for Small Fry



BATHTUB toys fascinate children, and this one does more than just float. Push the tail in and out and Squirty the Whale spouts madly. A piece of scrap wood, 6″ long and 3″ wide, will make the toy. If softwood is used, shaping is easier.

Drill a ¼″ hole 2″ deep in the wood at one end, as shown at *A*. Cut off a 1″ slice, which later forms the tail. Enlarge the ¼″ hole in the larger piece to a close fit for a 4″ length of ¼″-inside-diameter plastic tubing. Force the tubing into the hole. If it fits loosely, secure with waterproof cement. With the tubing in place, drill a 3/32″ hole from the top, as at *B*, so that it pierces the tubing in the block at its extreme end. Drill two 3/16″ openings, in line with each other, through wood and tubing, as at *C*.



Secure a ¼″ plastic rod in the tail piece so that it protrudes 4″ from the forward end. The rod must slide freely but not loosely in the tubing in the body.

Insert the rod in the tubing, aligning the two pieces of wood exactly. Now cut out the whale with a jigsaw. To make it float upright, and to keep tube and rod below the water line, cement or screw a 1-oz. weight to the bottom of the whale. Finish the toy with a good grade of glossy enamel. —*S. Spitzer, New York City.*

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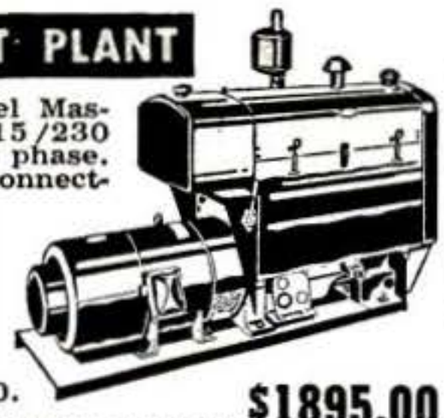
DIESEL LIGHT PLANT

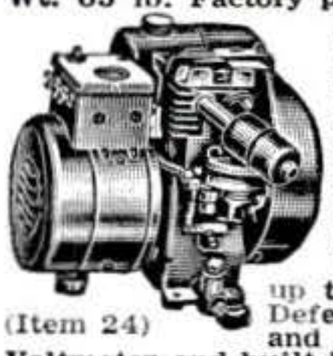


(Item 1660) Diesel Master—11-12 kw. 115/230 v. AC single or 3 phase. 1800 rpm direct connected. Electric Self-starting. Engineered for permanent power where continuous low-cost, heavy duty service is important. Wt. 1350 lb. Reg. list $3650.00. Factory Price..... **$1895.00**

10-11 kw. **GAS DRIVEN PLANT.** 115-230 v. 60 cyc. AC, single or 3 phase, powered by 4 cylinder Wisconsin air cooled engine. Belt driven. With self-starter. Constructed similarly to Hi-Line 6 KW shown below but much larger. (Item 217) Wt. 900 lb. Factory price..... **$1145.00**

PORTABLE LIGHT PLANTS

350 Watt Plant (Item 273) 115 v. DC. 1½ hp. Briggs Engine. Perfect for lights, radios and small power tools, etc. Wt. 65 lb. Factory price..... **$99.75**



(Item 24)

PUSH BUTTON START

AC Plant 600-700 Watts —115 v.-60 cyc. Powered by a rugged 2 hp. easy-starting Briggs gas engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 w. Ideal for Civil Defense, Fire Depts., trailers and camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Item 24. Wt. 75 lbs. Be prepared if war or storms knock out power lines. Reg. $275.00 value.. **$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but with larger generator and engine—50% greater output.. **$199.50**

1500-1700 Watt Plant (Item 20)—Similar to Item 24, but has three times more capacity. Wt. 173 lb. Factory price **$279.50**

MASTER-LITE 2500 Watt PLANT

(Item 21)

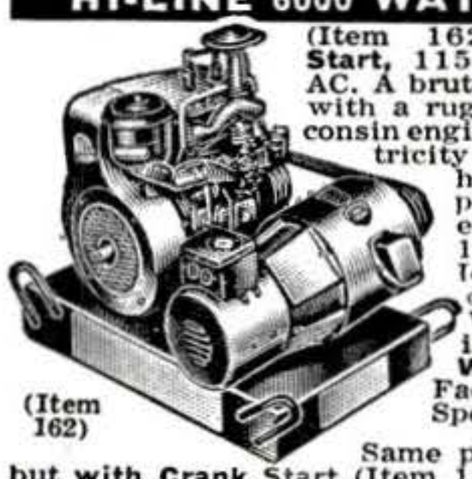
110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 Briggs engine, complete with all accessories. Includes control box, voltmeter and handy plug-in power receptacle. Ideal for permanent or stand-by service. Wt. 225 lb. Regular price $645.00. Factory price.. **$329.50**

3500 Watt Plant Push Button Start (Item 23) 115 v. 60 cyc. AC. Similar to above, but larger and 33% more capacity. Wt. 270 lbs. Reg. $760. Factory Price..... **$379.50**

GIANT 2000-2500 Watt Plant—110/120 v. AC, belt driven so that engine may easily be utilized for other purposes. Powered by a rope start. 6 HP engine. Wt. 210 lb. Regular list price $585.00. Factory price (Item 31)..... **$299.50**

Generator only and control box (Item 31a) **$169.50**

HI-LINE 6000 WATT PLANT



(Item 162)

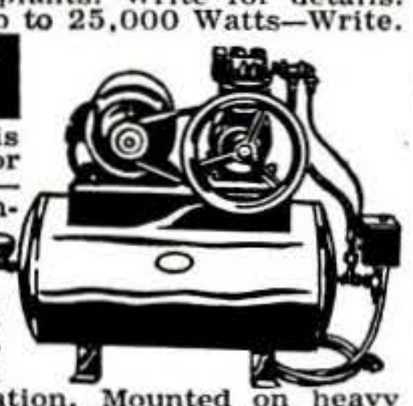
(Item 162) **Push Button Start,** 115-230 v. 60 cycle AC. A brute of a power plant with a rugged 14 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995.00. **With self starter.** Factory Spec.... **$645.00**

Same plant **but with Crank Start** (Item 166).. **$585.00**

Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price **$345.00**

We make fully automatic controls to operate any of above light plants. Write for details. We make all sizes up to 25,000 Watts—Write.

MASTER SHOP COMPRESSOR



Big and rugged. This stationary compressor provides 8 c.f.m. — plenty of air for industrial uses, powered by heavy duty repulsion induction ¾ HP, 115/230 v. motor. Factory type twin cylinder compressor designed for continuous operation. Mounted on heavy 20 gal. steel tank. Complete with unloader type automatic switch, pressure relief valve, check valve, gauge, shut-off valve, and 20 ft. heavy duty air hose. (Item 209h) Regular retail $319.50. Factory price **$179.95**

BUY FACTORY DIRECT—SAVE

NEW MOTOR BIKE

Our Commando Motor Bike is trouble-free—carries amazing 5 yr. guarantee. Goes up to 150 miles per gal. on all roads. Speed to 40 mph. No oil or gas fumes. Easy automatic pedal or pull starting. Has new principle of automatic transmission. No belts or chains—power transmitted directly to rear wheel. Accelerates quickly. Complete motor and kit ready to attach to your bike in one hour. Get FREE folder. Factory Price **$125.00**

Complete motor and Chassis..... **$199.50**

1½ TON MASTER HANDEE DUMP

Here at last is an all-purpose 1½ ton dump trailer. Can be used anywhere, inside or out for hauling sand, gravel, dirt, coal, grain, trash, industrial scrap, etc. Unloads, tilts, dumps to either side with one pull of the handle—yet trailer cannot tip. Ruggedly built, girder type frame equipped with pneumatic 4:00x12x6 ply tires and Timken roller bearings. Easily towed by any car, truck, jeep, tractor, etc.—has universal ball hitch front and rear—several "Handee-Dumps" are instantly coupled together. Capacity 1½ ton—¾ yd., overall length 104", width 40", wheel base 84". (Item 237) Wt. 460 lb. Factory Special **$350.00**

DUAL TIRE (8 wheel) model, similar to above, 510 lb..... **$450.00**

SAVE $15--BUY of the MONTH

FLEXIBLE SHAFT

A precision built, heavy duty tool with amazing flexibility. Replaces a dozen individual tools—drills, buffs, grinds, sands, saws—handles jobs in impossible places. Fits any ½" shaft on lathe, drill press, grinder motor, spare gas or electric motors, etc. Heavy duty ⅝" piano wire core encased in tough rubber housing. Handle and arbor equipped with precision ball bearings, rugged industrial type for years of service. Arbor takes all ½" bore wire wheels, grindstone, etc. ½"-20 standard threads. Operates on any ¼, ⅓ or ½ hp. motor.

(Item 240) Wt. 10 lb. Reg. $29.95.. **$15.95**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM); 8" Fan, wt. 5 lbs. **$6.85**; 9" Fan, wt. 6 lbs. **$7.85**; 10" Fan, wt. 7 lbs. **$8.85**; 12" Fan, wt. 8 lbs. **$9.85. HEAVY DUTY FAN.** Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E)..... **$11.95**

12" Fan, wt. 10 lbs. (Item 10D).... **$12.95**

JET FLOW BLOWER

Tremendous air movement (1700 CFM) and quiet operation make this double inlet 10" turbine blower unbeatable for heating, cooling, drying and air conditioning. Ideal for attic or barn ventilation, converting gravity heating to forced air; spray booth exhausts, etc. Operates with any ¼, ⅓ or ½ HP motor. Oversized, long life bearings. Includes variable speed motor pulley and belt. Dimensions 19" hi x 8" x 16½". Outlet opening 13 x 11⅜". Wt. 45 lbs. Item 245. Reg. $54.50. Factory Special..... **$27.50**

HEAVY DUTY ¼ HP motor for above **$16.95**

MASTER AIR COMPRESSOR

Tank Tested up to 500 lbs. per sq. in.

(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and auto tires, greasing and the hundreds of other jobs done by compressed air. Piston type. 2" bore compressor with built-in air filter. Master built with hi-strength alloys and precision bearings. Stainless steel tank, 12"x24", 2100 cu. in. cap. Safe up to 500 lb. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lb.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Low factory prices. With ⅓ hp., 110 v. A.C. motor. (Reg. $175.00) (Item 209p)..... **$109.50**

With ½ hp. motor. Reg. $199.50 (Item 209Ap)..... **$129.50**

With 2 hp. Briggs Gas Engine. Reg. $199.50 (Item 209Bp)..... **$119.50**

MASTER GARDENER SELF-PROPELLED

It's a snow-blower It's a rotary mower
It's a power sickle It's a rotary tiller
It's a cultivator It's a plow

NO PUSHING

Tractor shown with Snow Blow Attachment

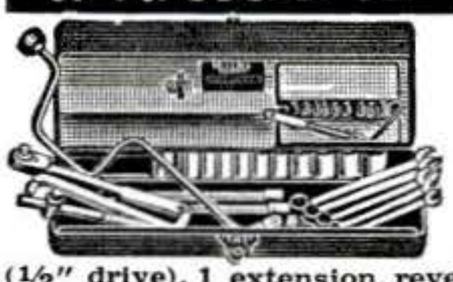
(Item 206)

Where can you get a power tool that does so many jobs? Works for you the year 'round. Does terrific job of cleaning snow from walks, drives, etc. without backbreaking work. Also prepares deep mellowed seed beds, cuts weeds, lawns, etc. The Master Gardener performs better — does more than tractors costing twice as much. Converts in minutes to Tiller, Power Sickle, etc. Basic self-propelled 2 hp tractor. Briggs or Clinton engine. **$119.50**

Snow Blow...**$42.50** Rotary Tiller .**$42.50**
Cultivator ....**$8.75** Disc Harrow..**$15.75**
Furrowing Tool **$8.75** Plow **$15.00**
Rotary Lawn Mower.....**$42.50**
Sickle Bar Mower.....**$42.50**
Lawn Mower Hitch.....**$4.50**

Freight prepaid to most areas. Easy payment plan available.

37 Pc. SOCKET SET



Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome alloy, absolutely the best. Complete range of 17 sockets from ¼" thru ½" (¼" drive) and 7/16" thru 1-1/16" (½" drive), 1 extension, reversible ½" ratchet, adapter bit, sliding "T" handle, "L" handle, ½" speeder, 5 pc. alloy end wrench set, 8 pc. Allen wrench set, and a big doghouse tool box. We challenge anyone to match this value. Easily worth $41.95. Wt. 14 lb. (Item 59)..... **$16.95**

44 Pc. SOCKET SET

(Item 596) Same unconditionally guaranteed, non-breakable sockets above—but with added sizes. Complete range of 21 sockets from ¼" thru 7/16" (¼" drive) and 7/16" thru 1-1/16" (½" drive). Two extensions, reversible ½" ratchet, "L" handle, sliding "T" head, all angle coupling, ½" speeder, ¼" breakover, 5 pc. high chrome alloy combination wrench set and 8 pc. offset wrench set in big doghouse tool box with ample room for other tools. Reg. $49.50. Wt. 16 lb..... **$21.95**

52 Pc. SOCKET SET

(Item 205) Contains a complete set of sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautiful matched chromed thin wall alloy sockets in a sturdy handsome steel tool box. Wt. 17 lbs. List Price $62.90. Factory Special **$27.95**

EXTENSION CORD

Heavy duty, made of Buna insulated #14, 2 conductor stranded wire encased in a treated braid jacket moderately flexible and ideal where frequent coiling is not required. Resists oil, grease or water. Use indoors or out. Complete with heavy rubber plug and outlet. (Item 16) 40 ft. 2½ lbs..... **$1.99**

Combination 2-40 ft. and 1-20 ft. (total 100 ft.).....(Item 16c) **$4.95**

100 ft. length (1 piece)...(Item 16p) **$4.85**

NEOPRENE EXTENSION CORD

#16, 2 conductor stranded wire, extremely flexible, ideal for hedge trimmers, lawn mowers, power tools, etc. Tough and rugged, withstands any abuse. Complete with rubber plug and outlet. 40 ft. (Item 17a) wt. 2½ lbs. Regularly $4.95. SPECIAL..... **$2.49**

Combination 2-40 ft. and 1-20 ft. (total 100 ft. (Item 17n)..... **$5.95**

100 ft. length (1 piece)....(Item 17t) **$5.85**

Wire only. No fittings. 100 ft. (Item 17r) **$5.00**

NEOPRENE CABLE #14-2 (Item 185) Heavy duty, very flexible. 20 year quality. Wt. 9 lbs. 100 ft. Complete with rubber plug and outlet. *A terrific buy at only*..... **$8.95**

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HEAVY DUTY D-C ARC WELDER

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to ¾" plate using ¼" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and triple V belt or flat pulley. You can pay more, but you can't buy a better welder. Wt. 110 lbs. $400 value at **$99.75**

with mounting flange (Item 38)

DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Spec. **$119.50**

WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at.. **$10.50**

Write for prices on A.C. Arc Welders

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. Send 10c for BIG Catalog.

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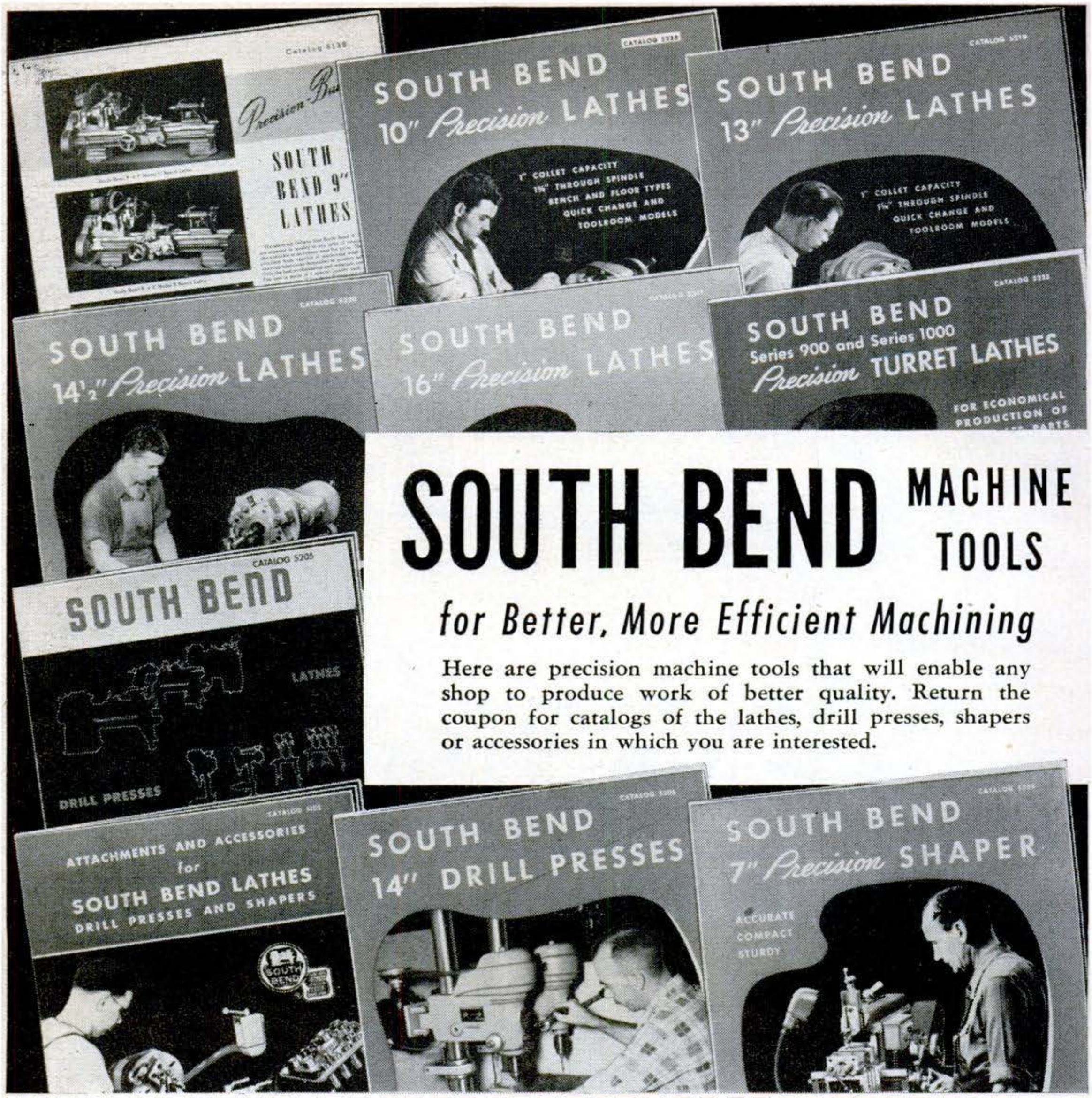

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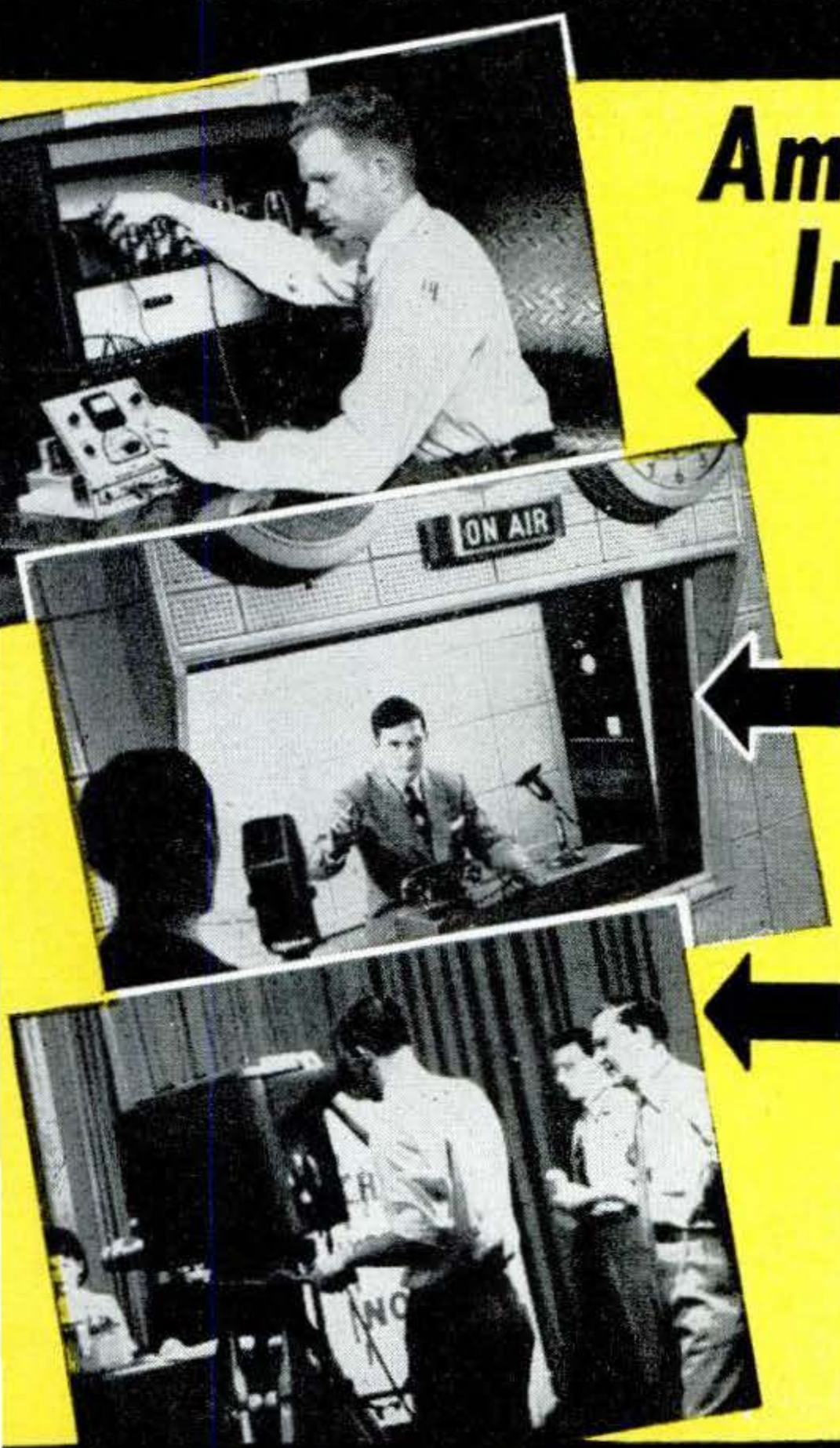

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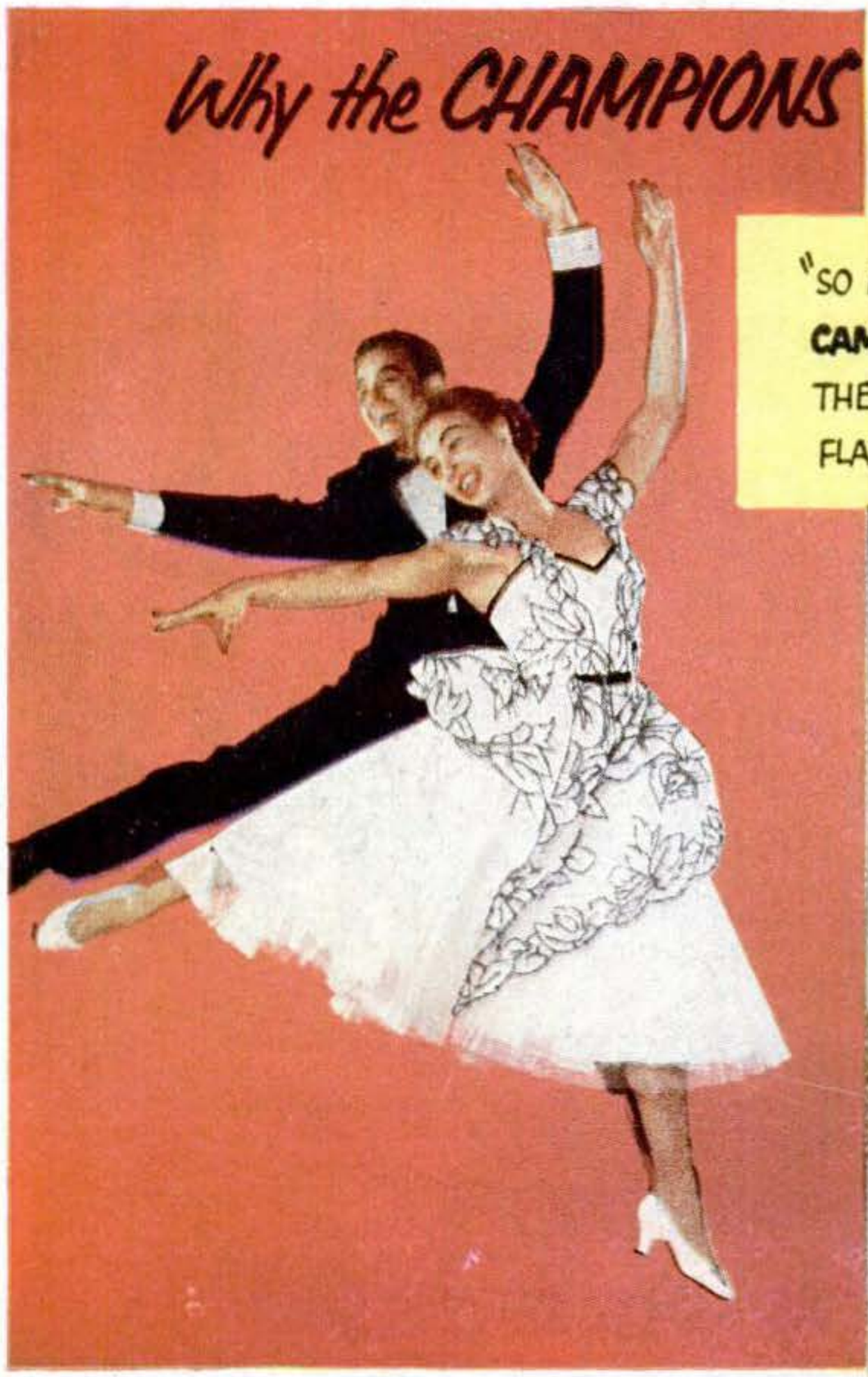

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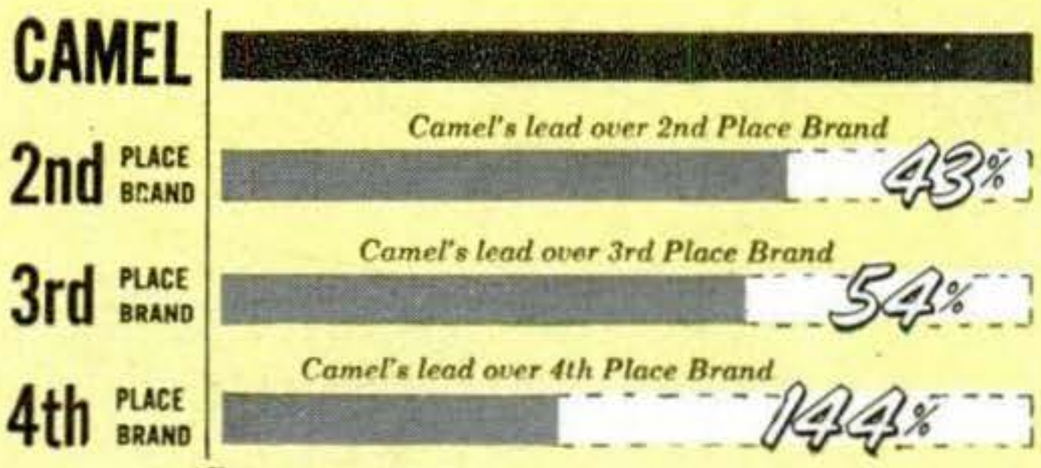

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